SEQUENCE LISTING

<110>   CHIRON SRL
         MASIGNANI, Vega
         ARICO, Maria Beatrice

<120>   Virulence-associated Adhesins

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<141>   2004-06-25

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Gly Thr Thr Val Ser Asn Tyr Ala Leu Ala Gln Ala Gln Ala Gln Ala
            20   25   30

Gln Val Lys Lys Asp Glu Leu Ser Glu Leu Lys Lys Gln Val Lys Glu
        35   40   45

Met Asp Ala Ala Ile Asp Gly Ile Leu Asp Asp Asn Ile Ala Tyr Glu
    50   55   60

Ala Glu Val Asp Ala Lys Leu Asp Gln His Ser Ala Ala Leu Gly Arg
65   70   75   80

His Thr Asn Arg Leu Asn Asn Leu Lys Thr Ile Ala Glu Lys Ala Lys
                85   90   95

Gly Asp Ser Ser Glu Ala Leu Asp Lys Ile Glu Ala Leu Glu Glu Gln
            100   105   110

Asn Asp Glu Phe Leu Ala Asp Ile Thr Ala Leu Glu Glu Gly Val Asp
            115   120   125

Gly Leu Asp Asp Asp Ile Ala Gly Ile Gln Asp Asn Ile Ser Asp Ile
    130   135   140

Glu Asp Asp Ile Asn Gln Asn Ser Ala Asp Ile Ala Thr Asn Thr Ala
145   150   155   160

Ala Ile Ala Thr His Thr Gln Arg Leu Asp Asn Leu Asp Asn Arg Val
                165   170   175

Asn Asn Leu Asn Lys Asp Leu Lys Arg Gly Leu Ala Ala Gln Ala Ala
            180   185   190

Leu Asn Gly Leu Phe Gln Pro Tyr Asn Val Gly Lys Leu Asn Leu Thr

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                195                   200                   205
Ala Ala Val Gly Gly Tyr Lys Ser Gln Thr Ala Val Ala Val Gly
    210               215               220

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<213>   Escherichia coli

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Met Lys Thr Val Asn Val Ala Leu Leu Ala Leu Ile Ile Ser Ala Thr
1               5                   10                  15

Ser Ser Pro Val Val Leu Ala Gly Asp Thr Ile Glu Ala Ala Ala Thr
            20                  25                  30

Glu Leu Ser Ala Ile Asn Ser Gly Met Ser Gln Ser Glu Ile Glu Gln
        35                  40                  45

Lys Ile Thr Arg Phe Leu Glu Arg Thr Asp Asn Ser Pro Ala Ala Tyr
    50                  55                  60

Thr Tyr Leu Thr Glu His His Tyr Ile Pro Ser Glu Thr Pro Asp Thr
65                  70                  75                  80

Thr Gln Thr Pro Thr Val Gln Thr Asp Pro Asp Ala Gly Gln Lys Thr
            85                  90                  95

Val Ala Ala Thr Gly Asp Val Gln Thr Thr Ala Arg Tyr Gln Ser Met
            100                 105                 110

Ile Asn Ala Arg Gln Ser Ala Val Thr Asp Ala Gln Gln Thr Gln Ile
        115                 120                 125

Thr Glu Gln Gln Ala Gln Ile Val Ala Thr Gln Lys Thr Leu Ala Ala
    130                 135                 140

Thr Gly Asp Thr Gln Asn Thr Ala His Tyr Gln Glu Met Ile Asn Ala
145                 150                 155                 160

Arg Leu Ala Ala Gln Asn Glu Ala Asn Gln Arg Thr Ala Thr Glu Gln
            165                 170                 175

Gly Gln Lys Met Asn Ala Leu Thr Thr Asp Val Ala Val Gln Gln Gln
            180                 185                 190

Asn Glu Arg Thr Gln Tyr Asp Lys Gln Met Gln Ser Leu Ala Gln Glu
            195                 200                 205

Ser Ala Gln Ala His Glu Gln Ile Asp Ser Leu Ser Gln Asp Val Thr
    210                 215                 220

Gln Thr His Gln Gln Leu Thr Asn Thr Gln Lys Arg Val Ala Asp Asn
225                 230                 235                 240

Ser Gln Gln Ile Asn Thr Leu Asn Asn His Phe Ser Ser Leu Lys Asn
            245                 250                 255

Glu Val Asp Asp Asn Arg Lys Glu Ala Asn Ala Gly Thr Ala Ser Ala
            260                 265                 270

Ile Ala Ile Ala Ser Gln Pro Gln Val Lys Thr Gly Asp Val Met Met
    275                 280                 285
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Val Ser Ala Gly Ala Gly Thr Phe Asn Gly Glu Ser Ala Val Ser Val
    290   295   300

Gly Thr Ser Phe Asn Ala Gly Thr His Thr Val Leu Lys Ala Gly Ile
305   310   315   320

Ser Ala Asp Thr Gln Ser Asp Phe Gly Ala Gly Val Gly Val Gly Tyr
                325   330   335

Ser Phe

<210>   3
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<212>   PRT
<213>   Escherichia coli

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Met Asn Lys Ile Phe Lys Val Ile Trp Asn Pro Ala Thr Gly Asn Tyr
1   5   10   15

Thr Val Thr Ser Glu Thr Ala Lys Ser Arg Gly Lys Lys Ser Gly Arg
                20   25   30

Ser Lys Leu Leu Ile Ser Ala Leu Val Ala Gly Gly Met Leu Ser Ser
            35   40   45

Phe Gly Ala Leu Ala Asn Ala Gly Asn Asp Asn Gly Gln Gly Val Asp
    50   55   60

Tyr Gly Ser Gly Ser Ala Gly Asp Gly Trp Val Ala Ile Gly Lys Gly
65   70   75   80

Ala Lys Ala Asn Thr Phe Met Asn Thr Ser Gly Ser Ser Thr Ala Val
                85   90   95

Gly Tyr Asp Ala Ile Ala Glu Gly Gln Tyr Ser Ser Ala Ile Gly Ser
            100   105   110

Lys Thr His Ala Ile Gly Gly Ala Ser Met Ala Phe Gly Val Ser Ala
        115   120   125

Ile Ser Glu Gly Asp Arg Ser Ile Ala Leu Gly Ala Ser Ser Tyr Ser
    130   135   140

Leu Gly Gln Tyr Ser Met Ala Leu Gly Arg Tyr Ser Lys Ala Leu Gly
145   150   155   160

Lys Leu Ser Ile Ala Met Gly Asp Ser Ser Lys Ala Glu Gly Ala Asn
            165   170   175

Ala Ile Ala Leu Gly Asn Ala Thr Lys Ala Thr Glu Ile Met Ser Ile
        180   185   190

Ala Leu Gly Asp Thr Ala Asn Ala Ser Lys Ala Tyr Ser Met Ala Leu
        195   200   205

Gly Ala Ser Ser Val Ala Ser Glu Glu Asn Ala Ile Ala Ile Gly Ala
    210   215   220

Glu Thr Glu Ala Ala Glu Asn Ala Thr Ala Ile Gly Asn Asn Ala Lys
225   230   235   240

Page 3

Ala Lys Gly Thr Asn Ser Met Ala Met Gly Phe Gly Ser Leu Ala Asp
                    245   250   255

Lys Val Asn Thr Ile Ala Leu Gly Asn Gly Ser Gln Ala Leu Ala Asp
                260   265   270

Asn Ala Ile Ala Ile Gly Gln Gly Asn Lys Ala Asp Gly Val Asp Ala
            275   280   285

Ile Ala Leu Gly Asn Gly Ser Gln Ser Arg Gly Leu Asn Thr Ile Ala
        290   295   300

Leu Gly Thr Ala Ser Asn Ala Thr Gly Asp Lys Ser Leu Ala Leu Gly
305   310   315   320

Ser Asn Ser Ser Ala Asn Gly Ile Asn Ser Val Ala Leu Gly Ala Asp
                325   330   335

Ser Ile Ala Asp Leu Asp Asn Thr Val Ser Val Gly Asn Ser Ser Leu
            340   345   350

Lys Arg Lys Ile Val Asn Val Lys Asn Gly Ala Ile Lys Ser Asp Ser
        355   360   365

Tyr Asp Ala Ile Asn Gly Ser Gln Leu Tyr Ala Ile Ser Asp Ser Val
    370   375   380

Ala Lys Arg Leu Gly Gly Gly Ala Ala Val Asp Val Asp Asp Gly Thr
385   390   395   400

Val Thr Ala Pro Thr Tyr Asn Leu Lys Asn Gly Ser Lys Asn Asn Val
            405   410   415

Gly Ala Ala Leu Ala Val Leu Asp Glu Asn Thr Leu Gln Trp Asp Gln
            420   425   430

Thr Lys Gly Lys Tyr Ser Ala Ala His Gly Thr Ser Ser Pro Thr Ala
        435   440   445

Ser Val Ile Thr Asp Val Ala Asp Gly Thr Ile Ser Ala Ser Ser Lys
    450   455   460

Asp Ala Val Asn Gly Ser Gln Leu Lys Ala Thr Asn Asp Asp Val Glu
465   470   475   480

Ala Asn Thr Ala Asn Ile Ala Thr Asn Thr Ser Asn Ile Ala Thr Asn
            485   490   495

Thr Ala Asn Ile Ala Thr Asn Thr Thr Asn Ile Thr Asn Leu Thr Asp
        500   505   510

Ser Val Gly Asp Leu Gln Ala Asp Ala Leu Leu Trp Asn Glu Thr Lys
    515   520   525

Lys Ala Phe Ser Ala Ala His Gly Gln Asp Thr Thr Ser Lys Ile Thr
    530   535   540

Asn Val Lys Asp Ala Asp Leu Thr Ala Asp Ser Thr Asp Ala Val Asn
545   550   555   560

Gly Ser Gln Leu Lys Thr Thr Asn Asp Ala Val Ala Thr Asn Thr Thr
            565   570   575

Asn Ile Ala Asn Asn Thr Ser Asn Ile Ala Thr Asn Thr Thr Asn Ile
            580   585   590

Ser Asn Leu Thr Glu Thr Val Thr Asn Leu Gly Glu Asp Ala Leu Lys
            595   600   605

Trp Asp Lys Asp Asn Gly Val Phe Thr Ala Ala His Gly Thr Glu Thr
    610   615   620

Thr Ser Lys Ile Thr Asn Val Lys Asp Gly Asp Leu Thr Thr Gly Ser
625   630   635   640

Thr Asp Ala Val Asn Gly Ser Gln Leu Lys Thr Thr Asn Asp Ala Val
            645   650   655

Ala Thr Asn Thr Thr Asn Ile Ala Thr Asn Thr Thr Asn Ile Ser Asn
            660   665   670

Leu Thr Glu Thr Val Thr Asn Leu Gly Glu Asp Ala Leu Lys Trp Asp
        675   680   685

Lys Asp Asn Gly Val Phe Thr Ala Ala His Gly Asn Asn Thr Ala Ser
    690   695   700

Lys Ile Thr Asn Ile Leu Asp Gly Thr Val Thr Ala Thr Ser Ser Asp
705   710   715   720

Ala Ile Asn Gly Ser Gln Leu Tyr Asp Leu Ser Ser Asn Ile Ala Thr
            725   730   735

Tyr Phe Gly Gly Asn Ala Ser Val Asn Thr Asp Gly Val Phe Thr Gly
            740   745   750

Pro Thr Tyr Lys Ile Gly Glu Thr Asn Tyr Tyr Asn Val Gly Asp Ala
        755   760   765

Leu Ala Ala Ile Asn Ser Ser Phe Ser Thr Ser Leu Gly Asp Ala Leu
    770   775   780

Leu Trp Asp Ala Thr Ala Gly Lys Phe Ser Ala Lys His Gly Thr Asn
785   790   795   800

Gly Asp Ala Ser Val Ile Thr Asp Val Ala Asp Gly Glu Ile Ser Asp
            805   810   815

Ser Ser Ser Asp Ala Val Asn Gly Ser Gln Leu His Gly Val Ser Ser
            820   825   830

Tyr Val Val Asp Ala Leu Gly Gly Gly Ala Glu Val Asn Ala Asp Gly
    835   840   845

Thr Ile Thr Ala Pro Thr Tyr Thr Ile Ala Asn Ala Asp Tyr Asp Asn
    850   855   860

Val Gly Asp Ala Leu Asn Ala Ile Asp Thr Thr Leu Asp Asp Ala Leu
865   870   875   880

Leu Trp Asp Ala Asp Ala Gly Glu Asn Gly Ala Phe Ser Ala Ala His
            885   890   895

Gly Lys Asp Lys Thr Ala Ser Val Ile Thr Asn Val Ala Asn Gly Ala
            900   905   910

Page 5

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Ile Ser Ala Ala Ser Ser Asp Ala Ile Asn Gly Ser Gln Leu Tyr Thr
        915                 920             925

Thr Asn Lys Tyr Ile Ala Asp Ala Leu Gly Gly Asp Ala Glu Val Asn
    930                 935             940

Ala Asp Gly Thr Ile Thr Ala Pro Thr Tyr Thr Ile Ala Asn Ala Glu
945                 950             955                 960

Tyr Asn Asn Val Gly Asp Ala Leu Asp Ala Leu Asp Asp Asn Ala Leu
                965             970             975

Leu Trp Asp Glu Thr Ala Asn Gly Gly Ala Gly Ala Tyr Asn Ala Ser
            980             985             990

His Asp Gly Lys Ala Ser Ile Ile Thr Asn Val Ala Asn Gly Ser Ile
        995             1000            1005

Ser Glu Asp Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Asn Ala Thr
    1010            1015            1020

Asn Met Met Ile Glu Gln Asn Thr Gln Ile Ile Asn Gln Leu Ala Gly
1025            1030            1035            1040

Asn Thr Asp Ala Thr Tyr Ile Gln Glu Asn Gly Ala Gly Ile Asn Tyr
            1045            1050            1055

Val Arg Thr Asn Asp Asp Gly Leu Ala Phe Asn Asp Ala Ser Ala Gln
        1060            1065            1070

Gly Val Gly Ala Thr Ala Ile Gly Tyr Asn Ser Val Ala Lys Gly Asp
        1075            1080            1085

Ser Ser Val Ala Ile Gly Gln Gly Ser Tyr Ser Asp Val Asp Thr Gly
    1090            1095            1100

Ile Ala Leu Gly Ser Ser Ser Val Ser Ser Arg Val Ile Ala Lys Gly
1105            1110            1115            1120

Ser Arg Asp Thr Ser Ile Thr Glu Asn Gly Val Val Ile Gly Tyr Asp
            1125            1130            1135

Thr Thr Asp Gly Glu Leu Leu Gly Ala Leu Ser Ile Gly Asp Asp Gly
        1140            1145            1150

Lys Tyr Arg Gln Ile Ile Asn Val Ala Asp Gly Ser Glu Ala His Asp
        1155            1160            1165

Ala Val Thr Val Arg Gln Leu Gln Asn Ala Ile Gly Ala Val Ala Thr
    1170            1175            1180

Thr Pro Thr Lys Tyr Phe His Ala Asn Ser Thr Glu Glu Asp Ser Leu
1185            1190            1195            1200

Ala Val Gly Thr Asp Ser Leu Ala Met Gly Ala Lys Thr Ile Val Asn
            1205            1210            1215

Gly Asp Lys Gly Ile Gly Ile Gly Tyr Gly Ala Tyr Val Asp Ala Asn
        1220            1225            1230

Ala Leu Asn Gly Ile Ala Ile Gly Ser Asn Ala Gln Val Ile His Val
    1235            1240            1245

Asn Ser Ile Ala Ile Gly Asn Gly Ser Thr Thr Thr Arg Gly Ala Gln
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      1250                    1255                    1260
Thr Asn Tyr Thr Ala Tyr Asn Met Asp Ala Pro Gln Asn Ser Val Gly
1265                1270                1275                1280

Glu Phe Ser Val Gly Ser Ala Asp Gly Gln Arg Gln Ile Thr Asn Val
                1285                1290                1295

Ala Ala Gly Ser Ala Asp Thr Asp Ala Val Asn Val Gly Gln Leu Lys
            1300                1305                1310

Val Thr Asp Ala Gln Val Ser Gln Asn Thr Gln Ser Ile Thr Asn Leu
        1315                1320                1325

Asp Asn Arg Val Thr Asn Leu Asp Ser Arg Val Thr Asn Ile Glu Asn
    1330                1335                1340

Gly Ile Gly Asp Ile Val Thr Thr Gly Ser Thr Lys Tyr Phe Lys Thr
1345                1350                1355                1360

Asn Thr Asp Gly Val Asp Ala Ser Ala Gln Gly Lys Asp Ser Val Ala
            1365                1370                1375


Ile Gly Ser Gly Ser Ile Ala Ala Ala Asp Asn Ser Val Ala Leu Gly
            1380                1385                1390

Thr Gly Ser Val Ala Thr Glu Glu Asn Thr Ile Ser Val Gly Ser Ser
        1395                1400                1405

Thr Asn Gln Arg Arg Ile Thr Asn Val Ala Ala Gly Lys Asn Ala Thr
    1410                1415                1420

Asp Ala Val Asn Val Ala Gln Leu Lys Ser Ser Glu Ala Gly Gly Val
1425                1430                1435                1440

Arg Tyr Asp Thr Lys Ala Asp Gly Ser Ile Asp Tyr Ser Asn Ile Thr
            1445                1450                1455

Leu Gly Gly Gly Asn Gly Gly Thr Thr Arg Ile Ser Asn Val Ser Ala
            1460                1465                1470

Gly Val Asn Asn Asn Asp Val Val Asn Tyr Ala Gln Leu Lys Gln Ser
        1475                1480                1485

Val Gln Glu Thr Lys Gln Tyr Thr Asp Gln Arg Met Val Glu Met Asp
    1490                1495                1500

Asn Lys Leu Ser Lys Thr Glu Ser Lys Leu Ser Gly Gly Ile Ala Ser
1505                1510                1515                1520

Ala Met Ala Met Thr Gly Leu Pro Gln Ala Tyr Thr Pro Gly Ala Ser
            1525                1530                1535

Met Ala Ser Ile Gly Gly Gly Thr Tyr Asn Gly Glu Ser Ala Val Ala
            1540                1545                1550

Leu Gly Val Ser Met Val Ser Ala Asn Gly Arg Trp Val Tyr Lys Leu
        1555                1560                1565

Gln Gly Ser Thr Asn Ser Gln Gly Glu Tyr Ser Ala Ala Leu Gly Ala
    1570                1575                1580

Gly Ile Gln Trp
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1585

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<213> Actinobacillus actinomycetemcomitans

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1   5   10   15

Gly Ala Ile Ser Val Asn Ala Leu Ala Lys Asp Ser Phe Leu Glu Asn
            20   25   30

Pro Ser Ala Asn Leu Pro Gln Gln Val Phe Lys Asn Arg Val Asp Ile
        35   40   45

Phe Asn Asn Glu Thr Asn Ile Asn Glu Asn Lys Lys Asp Ile Ala Ile
    50   55   60

Asn Lys Ala Asn Ile Ala Ser Ile Glu Lys Asp Val Met Arg Asn Thr
65   70   75   80

Gly Gly Ile Asp Arg Leu Ala Lys Gln Glu Leu Val Asn Arg Ala Arg
                85   90   95

Ile Thr Lys Asn Glu Leu Asp Ile Arg Lys Asn Thr Lys Ser Ile Ala
            100   105   110

Glu Asn Thr Ala Ser Ile Ala Arg Ile Asp Gly Asn Leu Glu Gly Val
            115   120   125

Asn Arg Val Leu Gln Asn Val Asp Val Arg Ser Thr Glu Asn Ala Ala
    130   135   140

Arg Ser Arg Ala Asn Glu Gln Lys Ile Ala Glu Asn Lys Lys Ala Ile
145   150   155   160

Glu Asn Lys Ala Asp Lys Ala Asp Val Glu Lys Asn Arg Ala Asp Ile
                165   170   175

Ala Ala Asn Ser Arg Ala Ile Ala Thr Phe Arg Ser Ser Ser Gln Asn
            180   185   190

Ile Ala Ala Leu Thr Thr Lys Val Asp Arg Asn Thr Ala Arg Ile Asp
            195   200   205

Arg Leu Asp Ser Arg Val Asn Glu Leu Asp Lys Glu Val Lys Asn Gly
    210   215   220

Leu Ala Ser Gln Ala Ala Leu Ser Gly Leu Phe Gln Pro Tyr Asn Val
225   230   235   240

Gly Ser Leu Asn Leu Ser Ala Ala Val Gly Gly Tyr Lys Ser Lys Thr
            245   250   255

Ala Leu Ala Val Gly Ser Gly Tyr Arg Phe Asn Gln Asn Val Ala Ala
            260   265   270

Lys Ala Gly Val Ala Val Ser Thr Asn Gly Gly Ser Ala Thr Tyr Asn
            275   280   285

Val Gly Leu Asn Phe Glu Trp
    290   295

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Met Lys Lys Val Gln Phe Phe Lys Tyr Ser Ser Leu Ala Leu Ala Leu
1   5   10   15

Gly Leu Gly Val Ser Ala Ser Ala Leu Ala Ala Pro Thr Ser Thr Ser
            20   25   30

Thr Thr Thr Gly Pro Glu Ala Pro Pro Thr Gly Pro Ala Pro Thr Ala
            35   40   45

Lys Asp Pro Leu Ala Glu Thr Ala Leu Ala Tyr Asp Leu Glu Asn Glu
    50   55   60

Val Ala Tyr Leu Arg Met Lys Ala Gly Glu Trp Met Gln Leu Gly Leu
65   70   75   80

Asp Pro Glu Lys Glu Val Ile Lys Gly Trp Asn Glu Val Lys Ser Leu
                85   90   95

Pro Arg Ile Asp Gly Asn Gly Lys Asp Lys Gln Thr Lys Asp Gln Ile
            100   105   110

Ala Met Leu Ile Arg Thr Val Asp Asn Thr Lys Glu Leu Gly Arg Ile
        115   120   125

Val Ser Thr Asn Ile Glu Asp Ile Lys Asn Leu Lys Lys Glu Leu Tyr
    130   135   140

Gly Phe Val Glu Asp Val Asn Glu Ser Glu Ala Arg Asn Ile Ser Arg
145   150   155   160

Ile Asp Glu Asn Glu Lys Asp Ile Lys Asn Leu Lys Lys Glu Leu Tyr
                165   170   175

Asp Phe Val Glu Asp Val Asn Glu Ser Glu Ala Arg Asn Ile Ser Arg
            180   185   190

Ile Asp Glu Asn Glu Lys Asp Ile Asn Thr Leu Lys Glu Leu Met Asp
        195   200   205

Glu Asp Leu Asn Ser Val Leu Thr Gln Ile Glu Asp Val Lys Leu Thr
    210   215   220

Phe Gln Asp Val Asn Asp Asn Val Asn Leu Ala Phe Glu Glu Ile Asn
225   230   235   240

Gly Asn Ala Gln Lys Phe Asp Thr Ala Ile Glu Gly Leu Thr Ser Gly
                245   250   255

Leu Ser Asp Leu Gln Ala Lys Val Asp Ala Asn Lys Gln Glu Thr Glu
            260   265   270

Asp Asp Ile Ala Asp Asn Ala Lys Ala Ile His Ser Asn Thr Lys Gly
        275   280   285

Ile Ala Lys Asn Thr Lys Asp Ile Arg Asp Leu Asp Thr Lys Thr Lys
    290   295   300

Page 9

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Gln Met Leu Glu Asn Asp Lys Asn Leu Met Thr Gly Leu Glu Ser Leu
305                 310                 315                 320

Ala Thr Glu Thr Ser Lys Gly Phe Glu Arg Phe Asp Val Lys Thr Gln
                325                 330                 335

Gln Leu Asp Gln Ala Val Ala Asn Val Val Gly Arg Val Asp Ile Thr
            340                 345                 350

Glu Gln Ala Ile Arg Gln Asn Thr Ala Gly Leu Val Asn Val Asn Lys
            355                 360                 365

Arg Val Asp Thr Leu Asp Lys Asn Thr Lys Ala Gly Ile Ala Ser Ala
    370                 375                 380

Val Ala Leu Gly Met Leu Pro Gln Ser Thr Ala Pro Gly Lys Ser Leu
385                 390                 395                 400

Val Ser Leu Gly Val Gly His His Arg Gly Gln Ser Ala Thr Ala Ile
            405                 410                 415

Gly Val Ser Ser Met Ser Ser Asn Gly Lys Trp Val Val Lys Gly Gly
            420                 425                 430

Met Ser Tyr Asp Thr Gln Arg His Ala Thr Phe Gly Gly Ser Val Gly
        435                 440                 445

Phe Phe Phe Asn
    450

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<213>    Haemophilus ducreyi

<400>    6
Met Lys Ile Lys Cys Leu Val Ala Val Val Gly Leu Ala Cys Ser Thr
1               5                   10                  15

Ile Thr Thr Met Ala Gln Gln Pro Pro Lys Phe Ala Gly Val Ser Ser
            20                  25                  30

Leu Tyr Ser Tyr Glu Tyr Asp Tyr Gly Lys Gly Lys Trp Thr Trp Ser
        35                  40                  45

Asn Glu Gly Gly Phe Asp Ile Lys Val Pro Gly Ile Lys Met Lys Pro
    50                  55                  60

Lys Glu Trp Ile Ser Lys Gln Ala Thr Tyr Leu Glu Leu Gln His Tyr
65                  70                  75                  80

Met Pro Tyr Thr Pro Val Leu Val Thr Ser Ala Pro Asp Val Ser Pro
                85                  90                  95

Ser Ser Ile Ser Ile Leu Leu Tyr Pro Met Ser Asp Pro Asp Gln Leu
            100                 105                 110

Gly Ile Asn Arg Gln Gln Leu Lys Leu Asn Leu Tyr Ser Tyr Phe Asn
        115                 120                 125

Asp Leu Arg His Asp Phe Lys Leu Lys Val Leu Asp Ala Arg Ile Ser
    130                 135                 140
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Lys Asn Lys Gln Asn Ile Asp Thr Ile Ser Lys Tyr Leu Leu Glu Leu
145             150             155             160

Gly Thr Tyr Leu Asp Gly Ser Tyr Arg Met Met Glu Gln Asn Thr His
                165             170             175

Asn Ile Asn Lys Asn Thr His Asn Ile Asn Lys Asn Thr His Asn Ile
            180             185             190

Asn Lys Leu Ser Lys Glu Leu Gln Thr Gly Leu Ala Asn Gln Ser Ala
        195             200             205

Leu Ser Met Leu Val Gln Pro Asn Gly Val Gly Lys Thr Ser Val Ser
    210             215             220

Ala Ala Val Gly Gly Tyr Arg Asp Lys Thr Ala Leu Ala Ile Gly Val
225             230             235             240

Gly Ser Arg Ile Thr Asp Arg Phe Thr Ala Lys Ala Gly Val Ala Phe
            245             250             255

Asn Thr Tyr Asn Gly Gly Met Ser Tyr Gly Ala Ser Val Gly Tyr Glu
            260             265             270

Phe


<210>    7
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<212>    PRT
<213>    Escherichia coli

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Met Lys Thr Val Asn Val Ala Leu Leu Ala Leu Ile Ile Ser Ala Thr
1                 5                 10              15

Ser Ser Pro Phe Val Leu Ala Gly Asp Thr Ile Glu Ala Ala Ala Thr
            20              25              30

Glu Leu Ser Ala Ile Asn Ser Gly Met Ser Gln Ser Glu Ile Glu Gln
        35              40              45

Lys Ile Thr Arg Phe Leu Glu Arg Thr Asp Asn Ser Pro Ala Ala Tyr
    50              55              60

Thr Tyr Leu Thr Glu His His Tyr Ile Pro Ser Glu Thr Pro Asp Thr
65              70              75              80

Thr Gln Thr Pro Pro Val Gln Thr Asp Pro Asp Ala Gly Gln Lys Thr
            85              90              95

Val Ala Ala Thr Gly Asp Val Gln Thr Thr Ala Arg Tyr Gln Ser Met
            100             105             110

Ile Asn Ala Arg Gln Ser Thr Val Thr Asp Ala Gln Gln Thr Gln Ile
        115             120             125

Thr Glu Gln Gln Ala Gln Ile Val Ala Thr Gln Lys Thr Leu Ala Ala
    130             135             140

Thr Gly Asp Thr Gln Asn Thr Ala His Tyr Gln Glu Met Ile Asn Ala
145             150             155             160
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Page 11

Arg Leu Ala Ala Gln Asn Glu Ala Asn Gln Arg Thr Thr Thr Glu Gln
            165   170   175

Gly Gln Lys Met Asn Ala Leu Thr Thr Asp Val Ala Ala Gln Gln Gln
            180   185   190

Lys Glu Arg Ala Gln Tyr Asp Lys Gln Met Gln Ser Leu Ala Gln Lys
            195   200   205

Ser Val Gln Ala His Glu Gln Ile Glu Ser Leu Arg Gln Asp Ser Ala
    210   215   220

Gln Thr Gln Gln Gln Leu Thr Asn Thr Gln Lys Arg Val Ala Asp Asn
225   230   235   240

Ser Gln Gln Ile Asn Thr Leu Asn Asn His Phe Ser Ser Leu Lys Asn
            245   250   255

Glu Val Glu Asp Asn Arg Lys Glu Ala Asn Ala Gly Thr Ala Ser Ala
            260   265   270

Ile Ala Ile Ala Ser Gln Pro Gln Val Lys Thr Gly Asp Leu Met Met
            275   280   285

Val Ser Ala Gly Ala Gly Thr Phe Asn Gly Glu Ser Ala Val Ser Val
    290   295   300

Gly Thr Ser Phe Asn Ala Gly Thr His Thr Val Leu Lys Ala Gly Ile
305   310   315   320

Ser Ala Asp Thr Gln Ser Asp Phe Gly Ala Gly Val Gly Val Gly Tyr
            325   330   335

Ser Phe

<210>   8
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<212>   PRT
<213>   Escherichia coli

<400>   8
Met Lys Thr Val Lys Leu Ser Leu Leu Ala Val Val Val Ala Thr Ala
1   5   10   15

Val Ser Pro Ser Ala Phe Ala Gly Asp Thr Val Glu Ala Ala Thr Thr
            20   25   30

Glu Leu Thr Val Ile Gln Pro Gly Met Ser Gln Ser Glu Ile Asp Gln
            35   40   45

Lys Ile Gly Arg Phe Leu Glu Arg Thr Gly Asn Ser Val Ala Ala Gln
    50   55   60

Asn Tyr Leu Ile Ala His Asp Tyr Gln Thr Thr Thr Pro Gln Glu Asn
65   70   75   80

Thr Ala Ala Ser Pro Val Gln Pro Thr Asn Thr Leu Asn Pro Ile Thr
            85   90   95

Asn Gln Ala Gln Thr Asp Arg Asp Asn Gly Gln Asp Thr Ala Ile Gln
            100   105   110

Asp Ala Gln His Ala Ala Asn Trp Ala Ser Leu Lys Ala Asp Asp Ala

115   120   125

Gln His Ala Ile Thr Val Ala Gln Thr Asp Ile Asp Ala Asn Thr Ala
    130   135   140

Ala Ile Thr Asp Thr Arg Asn Asp Val Ser Ala Val Gln Ser Asp Val
145   150   155   160

Thr Asn Ile Lys Gly Asp Val Ala His Ala Gln Ser Thr Ala Asp His
                165   170   175

Ala Asn Ala Asn Ala Asn Thr Ala Leu Ile Asn Gly Val Lys Leu Ser
                180   185   190

Gly Ala Val Thr Glu Asn Lys Asn Asn Ile Glu Gln Asn Arg Ser Asp
                195   200   205

Ile Ala Asp Gln Gln Lys Leu Leu Ala Ser Asn Glu Gln Lys Gln Ile
    210   215   220

Val Arg Asp Asn Gly Gln Asp Thr Ala Ile Gln Asp Ala Gln His Ala
225   230   235   240

Ala Asn Trp Ala Ser Leu Lys Ala Asp Asp Ala Gln His Ala Ile Thr
                245   250   255

Val Ala Gln Thr Asp Ile Asp Ala Asn Lys Ala Ala Ile Thr Asp Ile
                260   265   270

Arg Asn Asp Val Ser Ala Val Gln Ser Asp Val Thr Asn Ile Lys Gly
                275   280   285

Asp Val Ala His Ala Gln Ser Thr Ala Asp His Ala Asn Ala Asn Ala
    290   295   300

Asn Thr Ala Leu Met Asn Gly Val Lys Leu Ser Ser Ala Val Thr Glu
305   310   315   320

Asn Lys Asn Asn Ile Glu Gln Asn Arg Ser Asp Ile Ala Asp Gln Gln
                325   330   335

Lys Leu Leu Ala Ser Asn Glu Gln Lys Gln Ile Val Arg Asp Asn Gly
                340   345   350

Gln Asp Thr Ala Ile Gln Asp Ala Gln His Ala Ala Asn Trp Ala Ser
    355   360   365

Met Lys Ala Asp Asp Ala Gln His Ala Ile Thr Val Ala Gln Thr Asp
    370   375   380

Ile Asp Ala Asn Lys Ala Ala Ile Ala Asp Thr Arg Asn Asp Val Ser
385   390   395   400

Ala Val Gln Ser Asp Val Thr Asn Ile Lys Gly Asp Val Ala His Ala
                405   410   415

Gln Ser Thr Ala Asp His Ala Asn Ala Asn Ala Asn Thr Ala Leu Ile
                420   425   430

Asn Gly Val Lys Leu Ser Gly Ala Val Thr Glu Asn Lys Asn Asn Ile
                435   440   445

Glu Gln Asn Arg Ser Asp Ile Ala Asp Gln Gln Gln Gln Leu Asp Glu
                            Page 13

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          450                455                460
Thr Arg Lys Ile Val Ala Ala Thr Gly Asp Val Gln Thr Ala Ala Arg
465                 470                475                480

Tyr Gln Ser Met Ile Asp Ala Arg Gln Thr Ala Ala Ala Asn Ala Gln
                485                490                495

Gln Ala Gln Ala Asp Thr Gln Gln Gln Met Asp Asp Gln Gln Lys
            500                505                510

Gln Ile Asp Ala Thr Gln Lys Thr Val Ser Ala Leu Gly Asp Ala Gln
            515                520                525

Thr Asn Ala His Tyr Gln Glu Met Val Asn Ala Gly Leu Arg Ala Gln
    530                535                540

Asn Asp Ala Asn Ala Arg Thr Ala Ala Glu Gln Lys Gln Lys Ile Asp
545                 550                555                560

Thr Leu Ala Thr Asn Gln Ala Thr Gln Gln His Ile Asn Ser Val Gln
                565                570                575

Tyr Gly Glu Gln Ile Gln Arg Leu Ala Gln Asp Ser Thr Gln Thr His
            580                585                590

Glu Gln Ile Asp Ser Leu Thr Gln Asp Val Thr Gln Thr His Gln Gln
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Leu Ser Asn Thr Gln Lys Arg Val Ala Asp Asn Ser Gln Gln Ile Thr
    610                615                620

Thr Leu Asn Asn His Phe Ser Ser Leu Lys Asn Glu Val Glu Asp Asn
625                 630                635                640

Arg Lys Glu Ala Asn Ala Gly Thr Ala Ser Ala Ile Ala Ile Ala Ser
                645                650                655

Gln Pro Gln Val Lys Ala Gly Asp Phe Met Met Met Ser Ala Gly Ala
            660                665                670

Gly Thr Phe Asn Gly Glu Ser Ala Val Ser Val Gly Thr Ser Phe Asn
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                20                25                30

Ser Lys Leu Leu Ile Ser Ala Leu Val Ala Gly Gly Met Leu Ser Ser
        35                40                45
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Phe Gly Val Gln Ala Gln Ala Gly Arg Asp Asn Gly Gln Gly Val Asn
    50   55   60

Tyr Gly Gln Gly Thr Gly Thr Gly Trp Val Ala Ile Gly Glu Asp Ala
65   70   75   80

Lys Ala Asn Ser Phe Thr Asp Thr Gly Gly Gly Ser Ser Thr Ala Val
                85   90   95

Gly Tyr His Ser Thr Ala Asp Gly Arg Trp Ser Thr Ala Leu Gly Ala
            100   105   110

Lys Thr His Ser Leu Gly Glu Ala Ser Val Ala Leu Gly Ile Asn Thr
        115   120   125

Thr Ser Ala Gly Glu Arg Ser Leu Ala Ile Gly Ala Ser Ala Thr Ser
    130   135   140

Thr Gly Gly Phe Ser Ile Ala Leu Gly Arg Tyr Ala Asn Ser Val Gly
145   150   155   160

Glu Phe Ser Ile Ala Gln Gly Asp His Ala Glu Thr Gly Ala Asp Asp
            165   170   175

Ala Ile Ala Phe Gly Arg Glu Ser Lys Ala Leu Gly Ile Met Ser Ile
            180   185   190

Ala Leu Gly Ala Thr Ala Asn Ala Ser Lys Glu Tyr Ala Met Ala Leu
        195   200   205

Gly Ala Ser Ser Ala Ala Ser Ala Ala Asn Ala Ile Ala Val Gly Arg
    210   215   220

Asn Ser Ala Ala Ala Gly Val Asp Ser Leu Ala Phe Gly Arg Gln Ser
225   230   235   240

Ala Ala Ser Ala Ala Asn Ala Ile Ala Met Gly Ala Glu Ser Lys Ala
            245   250   255

Ala Glu Asn Ala Thr Ala Val Gly Thr Asn Ala Glu Ala Asn Gly Leu
            260   265   270

Asn Ser Ile Ala Leu Gly Ser Gly Ser Ile Ala Asp Val Asp Asn Thr
        275   280   285

Ile Ala Leu Gly Asn Gln Ser Gln Ala Val Ala Ala Gly Ala Ile Ala
    290   295   300

Ile Gly Gln Gly Asn Lys Ala Asp Gly Ala Asn Ala Ile Ala Leu Gly
305   310   315   320

Asn Gly Ser Ile Thr Gly Gly Val Asn Ala Ile Ala Leu Gly Gln Gly
            325   330   335

Ser Tyr Ala Gly Leu Glu Asn Gly Thr Ala Ile Gly Ala Gln Ala Ser
            340   345   350

Ala Gln Gly Lys Asn Ser Val Ala Leu Gly Ala Gly Ser Val Ala Thr
            355   360   365

Asp Ala Asp Thr Val Ser Val Gly Asn Thr Thr Ala Gln Arg Gln Ile
    370   375   380

Page 15

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Val Asn Met Ala Ala Gly Asp Ile Ser Thr Thr Ser Thr Asp Ala Ile
385             390             395             400

Asn Gly Ser Gln Leu Tyr Ala Ile Ser Lys Ser Val Ala Asp Asn Leu
            405             410             415

Gly Gly Gly Ala Thr Val Asn Ala Gln Gly Val Val Thr Ser Pro Asn
        420             425             430

Tyr Arg Leu Lys Ser Gly Ile Phe Gly Thr Val Gly Asp Ala Leu Thr
        435             440             445

Gly Leu Asp Asn Asn Thr Leu Gln Trp Asp Ser Leu Lys Lys Ala Tyr
    450             455             460

Ser Ala Ala His Gly Thr Asp Thr Thr Ser Thr Ile Thr Asn Val Lys
465             470             475             480

Asp Gly Ala Ile Ser Asp Thr Ser Lys Asp Ala Val Asn Gly Ser Gln
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Leu Lys Thr Thr Asn Asp Asn Val Ala Thr Asn Thr Ala Asn Ile Thr
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Lys Asp Asp Ala Leu Leu Trp Asn Gly Thr Ala Phe Ser Ala Ala His
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Gly Thr Glu Ala Thr Ser Lys Ile Thr Asn Val Lys Asp Gly Asp Leu
545             550             555             560

Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Lys Thr Thr
            565             570             575

Asn Asp Asn Val Ala Thr Asn Thr Thr Asn Ile Thr Asn Leu Thr Asp
        580             585             590

Ser Val Gly Asp Leu Lys Asp Asp Ala Leu Leu Trp Asn Gly Thr Ala
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Phe Ser Ala Ala His Gly Thr Asp Ala Thr Ser Lys Ile Thr Asn Val
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Lys Asp Gly Asp Leu Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser
625             630             635             640

Gln Leu Lys Thr Thr Asn Asp Ala Val Ala Ala Asn Thr Thr Asn Ile
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Ala Thr Asn Thr Thr Asn Ile Thr Asn Leu Thr Asp Ala Val Asp Ser
        660             665             670

Leu Gly Asp Asp Ser Leu Leu Trp Asn Ala Thr Ala Gly Ala Phe Ser
    675             680             685

Ala Ala His Gly Thr Asp Ala Thr Ser Lys Ile Thr Asn Val Thr Ala
    690             695             700

Gly Asp Leu Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Gln Leu
705             710             715             720
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Page 16

Lys Thr Thr Asn Asp Ala Val Ala Ala Asn Thr Thr Asn Ile Ala Thr
            725   730   735

Asn Thr Thr Asn Ile Thr Asn Leu Thr Asp Ala Val Asp Ser Leu Gly
        740   745   750

Asp Asp Ser Leu Leu Trp Asn Ala Thr Ala Gly Ala Phe Ser Ala Ala
        755   760   765

His Gly Thr Asp Ala Thr Ser Lys Ile Thr Asn Val Lys Asp Gly Asp
    770   775   780

Leu Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Lys Thr
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Ser Leu Leu Trp Asn Ala Thr Ala Gly Ala Phe Ser Ala Lys His Gly
    835   840   845

Thr Asn Gly Thr Asp Ser Lys Ile Thr Asn Leu Leu Ala Gly Thr Val
    850   855   860

Ser Ser Asp Ser Thr Asp Ala Ile Asn Gly Ser Gln Leu Tyr Gly Leu
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Ala Asp Ser Phe Thr Ser Tyr Leu Gly Gly Gly Ala Asp Ile Ser Asp
            885   890   895

Ala Gly Val Leu Thr Gly Pro Thr Tyr Thr Ile Gly Gly Thr Asp Tyr
            900   905   910

Asn Asn Val Gly Asp Ala Leu Ala Ala Ile Asn Thr Ser Phe Ser Thr
        915   920   925

Ser Leu Gly Asp Ala Leu Leu Trp Asp Ala Thr Ala Lys Gly Gly Asp
    930   935   940

Gly Ala Phe Ser Ala Gly Arg Gly Thr Asp Asn Thr Ala Ser Ile Ile
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            965   970   975

Asn Gly Ser Gln Leu Tyr Asp Thr Ser Lys Tyr Ile Ala Asp Thr Leu
        980   985   990

Gly Gly Asp Ala Glu Val Asn Ala Asp Gly Thr Ile Thr Ala Pro Thr
    995   1000   1005

Tyr Ala Ile Ala Gly Gly Ser Tyr Ser Asn Val Gly Asp Ala Leu Glu
    1010   1015   1020

Ala Ile Asp Thr Thr Leu Asp Asp Ala Leu Leu Trp Asp Ala Thr Ala
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Asn Asp Gly Asn Gly Ala Phe Ser Ala Ala His Gly Lys Asp Lys Thr
            1045   1050   1055

Page 17

Ala Ser Val Ile Thr Asn Val Ala Asn Gly Ala Ile Ser Ala Thr Ser
         1060   1065   1070

Ser Asp Ala Ile Asn Gly Ser Gln Leu Tyr Thr Thr Asn Lys Tyr Ile
         1075   1080   1085

Ala Asp Ala Leu Gly Gly Asp Ala Glu Val Asn Ala Asp Gly Ser Ile
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Ser Ile Ile Thr Asn Val Ala Asp Gly Asn Ile Gly Glu Gly Ser Thr
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Gln Asn Ser Glu Ile Ile Asn Gln Leu Ala Gly Asn Thr Ser Glu Thr
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Tyr Ile Glu Asp Asn Gly Ala Gly Ile Asn Tyr Val Arg Thr Asn Asp
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Gly Gln Gly Ser Ser Ser Asn Val Asp Thr Gly Ile Ala Leu Gly Ser
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Ser Ser Val Ser Ser Arg Val Ile Val Lys Gly Ser Arg Asp Thr Ser
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Leu Leu Gly Ala Leu Ser Ile Gly Asp Asp Gly Lys Tyr Arg Gln Ile
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Ile Asn Val Ala Asp Gly Ser Glu Ala His Asp Ala Val Thr Val Arg
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Gln Leu Gln Asn Ala Ile Gly Ala Val Ala Thr Thr Pro Thr Lys Tyr
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Phe His Ala Asn Ser Thr Glu Glu Asp Ser Leu Ala Val Gly Glu Asp
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Ser Leu Ala Met Gly Ala Lys Thr Ile Val Asn Gly Asn Ala Gly Ile
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Gly Ile Gly Tyr Gly Ala Tyr Val Asp Ala Asn Ala Leu Asn Gly Ile
         1380   1385   1390

Ala Ile Gly Ser Asn Ala Arg Ala Asn His Ala Asn Ser Ile Ala Met
                              Page 18

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Gly Asn Gly Ser Gln Thr Thr Arg Gly Ala Gln Thr Gly Tyr Ala Ala
     1410                1415                1420

Tyr Asn Met Asp Ala Pro Gln Asn Ser Val Gly Glu Phe Ser Val Gly
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Ser Gln Leu Lys Ser Ser Glu Ala Gly Gly Val Arg Tyr Asp Thr Lys
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Asp Ala Val Asn Tyr Ala Gln Leu Lys Gln Ser Val Gln Glu Thr Lys
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Gln Tyr Thr Asp Gln Arg Met Val Glu Met Asp Asn Lys Leu Ser Lys
     1650                1655                1660

Thr Glu Ser Lys Leu Ser Gly Gly Ile Ala Ser Ala Met Ala Met Thr
1665                1670                1675                1680

Gly Leu Pro Gln Ala Tyr Thr Pro Gly Ala Ser Met Ala Ser Ile Gly
          1685                1690                1695

Gly Gly Thr Tyr Asn Gly Glu Ser Ala Val Ala Leu Gly Val Ser Met
          1700                1705                1710

Val Ser Ala Asn Gly Arg Trp Val Tyr Lys Leu Gln Gly Ser Thr Asn
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            35   40   45

Tyr Gly Asp Gly Ser Ala Gly Asp Gly Trp Val Ala Gly Lys Gly Ala
        50   55   60

Lys Ala Asn Thr Met Asn Thr Ser Gly Ala Ser Thr Ala Gly Tyr Asp
65   70   75   80

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            115   120   125

Ala Lys Thr Asn Gly Thr Ser Ala Gly Asp Ser Ser Ala Asp Gly Lys
    130   135   140

Thr Ala Gly Asn Thr Ala Lys Ala Tyr Met Ser Ala Gly Asp Asn Ala
145   150   155   160

Asn Ala Ser Lys Tyr Ala Met Ala Gly Ala Ser Ser Lys Ala Gly Gly
                165   170   175

Ala Asp Ser Ala Gly Arg Lys Ser Thr Ala Asn Ser Thr Gly Ser Ala
            180   185   190

Gly Ala Asp Ser Ser Ser Ser Asn Asp Asn Ala Ala Gly Asn Lys Thr
            195   200   205

Ala Gly Val Asn Ser Met Ala Gly Asn Ala Ser Ala Ser Gly Ser Ser
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Ala Gly Asn Thr Ser Ala Ser Asn Ala Ala Gly Gly Ser Ala Ser Lys
225   230   235   240

Val Asn Ser Ala Gly Ser Asn Ser Ser Ser Gly Asn Ala Ala Gly Gly
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Ser Ala Ala Gly Gly Ser Asn Ser Ala Gly Ser Ser Arg Ala Asn Gly
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Asn Asp Ser Val Ala Gly Val Gly Ala Ala Ala Ala Thr Asp Asn Ser
        275   280   285

Val Ala Gly Ala Gly Ser Thr Thr Asp Ala Ser Asn Thr Val Ser Val
    290   295   300

Page 20

Gly Asn Ser Ala Thr Lys Arg Lys Val Asn Met Ala Ala Gly Ala Ser
305   310   315   320

Asn Thr Ser Thr Asp Ala Asn Gly Ser Tyr Thr Ser Asp Ser Val Ala
          325   330   335

Lys Arg Gly Gly Gly Ala Thr Val Gly Ser Asp Gly Thr Val Thr Ala
          340   345   350

Val Ser Tyr Ala Arg Ser Gly Thr Tyr Asn Asn Val Gly Asp Ala Ser
          355   360   365

Gly Asp Asn Asn Thr Trp Asn Lys Thr Ala Gly Ala Ser Ala Asn His
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Gly Ala Asn Ala Thr Asn Lys Thr Asn Val Ala Lys Gly Thr Val Ser
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Ala Thr Ser Thr Asp Val Val Asn Gly Ser Tyr Asp Asp Ala Trp Asn
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Gly Thr Ala Ser Ala Ala His Gly Thr Ala Thr Ser Lys Thr Asn Val
          420   425   430

Thr Ala Gly Asn Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Lys
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Thr Thr Asn Asp Asn Val Thr Thr Asn Thr Thr Asn Ala Thr Asn Thr
     450   455   460

Thr Asn Thr Asn Thr Asp Ala Val Asn Gly Gly Asp Asp Ser Trp Asn
465   470   475   480

Lys Ala Ala Gly Ala Ser Ala Ala His Gly Thr Ala Thr Ser Lys Thr
          485   490   495

Asn Val Thr Ala Gly Asn Thr Ala Gly Ser Thr Asp Ala Val Asn Gly
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Val Asn Gly Ser Lys Thr Thr Asn Asp Asn Val Thr Thr Asn Thr Thr
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Asp Asp Ser Trp Asn Lys Thr Ala Gly Ala Ser Ala Ala His Gly Thr
     610   615   620

Asp Ala Thr Ser Lys Thr Asn Val Lys Ala Gly Asp Thr Ala Gly Ser
625   630   635   640

Page 21

Thr Asp Ala Val Asn Gly Ser Lys Thr Thr Asn Asp Asn Val Ser Thr
                 645   650   655

Asn Thr Thr Asn Thr Asn Thr Asp Ala Val Asn Gly Gly Asp Asp Ser
             660   665   670

Trp Asn Lys Thr Ala Gly Ala Ser Ala Ala His Gly Thr Asp Ala Thr
             675   680   685

Ser Lys Thr Asn Val Lys Ala Gly Asp Thr Ala Gly Ser Thr Asp Ala
    690   695   700

Val Asn Gly Ser Lys Thr Thr Asn Asp Asn Val Ser Thr Asn Thr Thr
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Asn Thr Asn Thr Asp Ser Val Gly Asp Lys Asp Asp Ser Trp Asn Lys
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Ala Ala Gly Ala Ser Ala Ala His Gly Thr Ala Thr Ser Lys Thr Asn
             740   745   750

Ala Gly Lys Ser Ser Asn Ser Thr Asp Ala Asn Gly Ser Tyr Gly Val
             755   760   765

Ala Asp Ser Thr Ser Tyr Gly Gly Gly Ala Asp Ser Asp Thr Gly Val
    770   775   780

Ser Gly Thr Tyr Thr Gly Gly Thr Asp Tyr Thr Asn Val Gly Asp Ala
785   790   795   800

Ala Ala Asn Thr Ser Ser Thr Ser Gly Asp Ala Trp Asp Ala Thr Ala
             805   810   815

Gly Lys Ser Ala Lys His Gly Asn Asn Ala Ser Val Thr Asp Val Ala
             820   825   830

Asn Gly Ala Val Ser Ser Thr Ser Ser Asp Ala Asn Gly Ser Tyr Gly
    835   840   845

Val Ser Asp Tyr Ala Asp Ala Gly Gly Asn Ala Val Val Asn Thr Asp
    850   855   860

Gly Ser Thr Thr Thr Tyr Ala Ala Gly Gly Ser Tyr Asn Asn Val Gly
865   870   875   880

Asp Ala Ala Asp Thr Thr Asp Asp Ala Trp Asp Thr Thr Ala Asn Gly
             885   890   895

Gly Asn Gly Ala Ser Ala Ala His Gly Lys Asp Lys Thr Ala Ser Val
             900   905   910

Thr Asn Val Ala Asn Gly Ala Val Ser Ala Thr Ser Asn Asp Ala Asn
    915   920   925

Gly Ser Tyr Ser Thr Asn Lys Tyr Ala Asp Ala Gly Gly Asp Ala Val
    930   935   940

Asn Ala Asp Gly Thr Thr Ala Thr Tyr Thr Ala Asn Thr Asp Tyr Asn
945   950   955   960

Asn Val Gly Ala Asp Ala Asp Asn Asn Ala Trp Asp Asp Ala Gly Ala
             965   970   975

Page 22

Tyr Asn Ala Ser His Asp Gly Asn Ala Ser Lys Thr Asn Val Ala Ala
       980   985   990

Gly Asp Ser Thr Thr Ser Thr Asp Ala Val Asn Gly Ser Asn Ala Thr
      995   1000   1005

Asn Val Thr Asn Ser Met Asn Ala Gly Asn Thr Ser Thr Tyr Asn Gly
  1010   1015   1020

Ala Gly Asn Tyr Val Arg Thr Asn Asp Ser Gly Ala Asn Asp Ala Ser
1025   1030   1035   1040

Ala Ser Gly Gly Ala Thr Ala Val Gly Tyr Asn Ala Val Ala Ser His
        1045   1050   1055

Ala Ser Ser Val Ala Gly Asp Ser Ser Val Asp Thr Gly Ala Gly Ser
      1060   1065   1070

Ser Ser Val Ser Ser Arg Val Val Lys Gly Thr Arg Asn Thr Ser Val
     1075   1080   1085

Ser Gly Val Val Gly Tyr Asp Thr Thr Asp Gly Gly Ala Ser Gly Asp
    1090   1095   1100

Asp Gly Lys Tyr Arg Asn Val Ala Asp Gly Ser Ala His Asp Ala Val
1105   1110   1115   1120

Thr Val Arg Asn Ala Gly Ala Val Ala Thr Thr Thr Lys Tyr Tyr His
        1125   1130   1135

Ala Asn Ser Thr Ala Asp Ser Ala Val Gly Asp Ser Ala Met Gly Ala
        1140   1145   1150

Lys Thr Val Asn Gly Asn Ala Gly Gly Gly Asn Thr Val Ala Asp Ala
        1155   1160   1165

Asn Gly Ala Gly Ser Asn Ala Arg Ala Asn His Ala Asp Ser Ala Met
  1170   1175   1180

Gly Asn Gly Ser Thr Thr Arg Gly Ala Thr Asn Tyr Thr Ala Tyr Asn
1185   1190   1195   1200

Met Asp Ala Asn Ser Val Gly Ser Val Gly Ser Asp Gly Arg Thr Asn
        1205   1210   1215

Val Ala Ala Gly Ser Ala Asp Thr Asp Ala Val Asn Val Gly Lys Val
        1220   1225   1230

Thr Asp Ala Val Ser Asn Thr Ser Thr Asn Asn Thr Val Thr Asn Asp
      1235   1240   1245

Thr Arg Val Thr Asn Asn Gly Gly Asp Val Thr Thr Gly Ser Thr Lys
     1250   1255   1260

Tyr Lys Thr Asn Thr Asp Gly Ala Asp Ala Asn Ala Gly Lys Asp Ser
1265   1270   1275   1280

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        1300   1305   1310

Thr Asn Val Ala Ala Gly Val Asn Ala Thr Asp Ala Val Asn Val Ser

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Lys Ser Ser Ala Gly Gly Val Arg Tyr Asp Thr Lys Ala Asp Gly Ser
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Asp Tyr Ser Asn Thr Gly Gly Gly Asn Ser Gly Thr Thr Arg Ser Asn
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Val Thr Lys Tyr Thr Asp Arg Met Val Met Asp Asn Lys Ser Lys Thr
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        1395              1400              1405

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    1410              1415              1420

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Ser Thr Asn Ser Gly Tyr Ser Ala Ala Gly Ala Gly Trp Met Asn Lys
            1445              1450              1455

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        1460              1465              1470

Ser Arg Gly Lys Lys Ser Gly Arg Ser Lys Ser Ala Val Ala Gly Gly
        1475              1480              1485

Ser Ser Gly Ala Ser Ala Asp Asn Tyr Thr Gly Thr Asp Tyr Gly Asp
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            1605              1610              1615

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        1620              1625              1630

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    1635              1640              1645

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             1685              1690              1695

Ala Gly Ser Asn Ser Ser Ser Gly Asn Ala Ala Gly Gly Ser Ala Ala
         1700              1705              1710

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         1715              1720              1725

Val Ala Gly Val Gly Ala Ala Ala Ala Thr Asp Asn Ser Val Ala Gly
     1730              1735              1740

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Ala Thr Lys Arg Lys Val Asn Met Ala Ala Gly Ala Ser Asn Thr Ser
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         1780              1785              1790

Gly Gly Ala Thr Val Gly Ser Asp Gly Thr Val Thr Ala Val Ser Tyr
         1795              1800              1805

Ala Arg Ser Gly Thr Tyr Asn Asn Val Gly Asp Ala Ser Gly Asp Asn
     1810              1815              1820

Asn Thr Trp Asn Lys Thr Ala Gly Ala Ser Ala Asn His Gly Ala Asn
1825              1830              1835              1840

Ala Thr Asn Lys Thr Asn Val Ala Lys Gly Thr Val Ser Ala Thr Ser
             1845              1850              1855

Thr Asp Val Val Asn Gly Ser Tyr Asp Asp Ala Trp Asn Gly Thr Ala
             1860              1865              1870

Ser Ala Ala His Gly Thr Ala Thr Ser Lys Thr Asn Val Thr Ala Gly
         1875              1880              1885

Asn Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Lys Thr Thr Asn
     1890              1895              1900

Asp Asn Val Thr Thr Asn Thr Thr Asn Ala Thr Asn Thr Thr Asn Thr
1905              1910              1915              1920

Asn Thr Asp Ala Val Asn Gly Gly Asp Asp Ser Trp Asn Lys Ala Ala
             1925              1930              1935

Gly Ala Ser Ala Ala His Gly Thr Ala Thr Ser Lys Thr Asn Val Thr
         1940              1945              1950

Ala Gly Asn Thr Ala Gly Ser Thr Asp Ala Val Asn Gly Ser Lys Thr
     1955              1960              1965

Thr Asn Asp Asn Val Thr Thr Asn Thr Thr Asn Ala Thr Asn Thr Thr
     1970              1975              1980

Asn Thr Asn Thr Asp Ala Val Asn Gly Gly Asp Asp Ser Trp Asn Lys
1985              1990              1995              2000
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Thr Ala Gly Ala Ser Ala Ala His Gly Thr Asp Ala Thr Ser Lys Thr
                2005   2010   2015

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            2020   2025   2030

Ser Lys Thr Thr Asn Asp Asn Val Thr Thr Asn Thr Thr Asn Ala Thr
        2035   2040   2045

Asn Thr Thr Asn Thr Asn Thr Asp Ala Val Asn Gly Gly Asp Asp Ser
    2050   2055   2060

Trp Asn Lys Thr Ala Gly Ala Ser Ala Ala His Gly Thr Asp Ala Thr
2065   2070   2075   2080

Ser Lys Thr Asn Val Lys Ala Gly Asp Thr Ala Gly Ser Thr Asp Ala
            2085   2090   2095

Val Asn Gly Ser Lys Thr Thr Asn Asp Asn Val Ser Thr Asn Thr Thr
            2100   2105   2110

Asn Thr Asn Thr Asp Ala Val Asn Gly Gly Asp Asp Ser Trp Asn Lys
        2115   2120   2125

Thr Ala Gly Ala Ser Ala Ala His Gly Thr Asp Ala Thr Ser Lys Thr
    2130   2135   2140

Asn Val Lys Ala Gly Asp Thr Ala Gly Ser Thr Asp Ala Val Asn Gly
2145   2150   2155   2160

Ser Lys Thr Thr Asn Asp Asn Val Ser Thr Asn Thr Thr Asn Thr Asn
            2165   2170   2175

Thr Asp Ser Val Gly Asp Lys Asp Asp Ser Trp Asn Lys Ala Ala Gly
        2180   2185   2190

Ala Ser Ala Ala His Gly Thr Ala Thr Ser Lys Thr Asn Ala Gly Lys
        2195   2200   2205

Ser Ser Asn Ser Thr Asp Ala Asn Gly Ser Tyr Gly Val Ala Asp Ser
    2210   2215   2220

Thr Ser Tyr Gly Gly Gly Ala Asp Ser Asp Thr Gly Val Ser Gly Thr
2225   2230   2235   2240

Tyr Thr Gly Gly Thr Asp Tyr Thr Asn Val Gly Asp Ala Ala Ala Asn
            2245   2250   2255

Thr Ser Ser Thr Ser Gly Asp Ala Trp Asp Ala Thr Ala Gly Lys Ser
        2260   2265   2270

Ala Lys His Gly Asn Asn Ala Ser Val Thr Asp Val Ala Asn Gly Ala
        2275   2280   2285

Val Ser Ser Thr Ser Ser Asp Ala Asn Gly Ser Tyr Gly Val Ser Asp
    2290   2295   2300

Tyr Ala Asp Ala Gly Gly Asn Ala Val Val Asn Thr Asp Gly Ser Thr
2305   2310   2315   2320

Thr Thr Tyr Ala Ala Gly Gly Ser Tyr Asn Asn Val Gly Asp Ala Ala
            2325   2330   2335

Asp Thr Thr Asp Asp Ala Trp Asp Thr Thr Ala Asn Gly Gly Asn Gly
        2340   2345   2350

Ala Ser Ala Ala His Gly Lys Asp Lys Thr Ala Ser Val Thr Asn Val
        2355   2360   2365

Ala Asn Gly Ala Val Ser Ala Thr Ser Asn Asp Ala Asn Gly Ser Tyr
    2370   2375   2380

Ser Thr Asn Lys Tyr Ala Asp Ala Gly Gly Asp Ala Val Asn Ala Asp
2385   2390   2395   2400

Gly Thr Thr Ala Thr Tyr Thr Ala Asn Thr Asp Tyr Asn Asn Val Gly
            2405   2410   2415

Ala Asp Ala Asp Asn Asn Ala Trp Asp Asp Ala Gly Ala Tyr Asn Ala
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Ser His Asp Gly Asn Ala Ser Lys Thr Asn Val Ala Ala Gly Asp Ser
        2435   2440   2445

Thr Thr Ser Thr Asp Ala Val Asn Gly Ser Asn Ala Thr Asn Val Thr
    2450   2455   2460

Asn Ser Met Asn Ala Gly Asn Thr Ser Thr Tyr Asn Gly Ala Gly Asn
2465   2470   2475   2480

Tyr Val Arg Thr Asn Asp Ser Gly Ala Asn Asp Ala Ser Ala Ser Gly
        2485   2490   2495

Gly Ala Thr Ala Val Gly Tyr Asn Ala Val Ala Ser His Ala Ser Ser
        2500   2505   2510

Val Ala Gly Asp Ser Ser Val Asp Thr Gly Ala Gly Ser Ser Ser Val
        2515   2520   2525

Ser Ser Arg Val Val Lys Gly Thr Arg Asn Thr Ser Val Ser Gly Val
    2530   2535   2540

Val Gly Tyr Asp Thr Thr Asp Gly Gly Ala Ser Gly Asp Asp Gly Lys
2545   2550   2555   2560

Tyr Arg Asn Val Ala Asp Gly Ser Ala His Asp Ala Val Thr Val Arg
        2565   2570   2575

Asn Ala Gly Ala Val Ala Thr Thr Thr Lys Tyr Tyr His Ala Asn Ser
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Thr Ala Asp Ser Ala Val Gly Asp Ser Ala Met Gly Ala Lys Thr Val
        2595   2600   2605

Asn Gly Asn Ala Gly Gly Gly Asn Thr Val Ala Asp Ala Asn Gly Ala
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Gly Ser Asn Ala Arg Ala Asn His Ala Asp Ser Ala Met Gly Asn Gly
2625   2630   2635   2640

Ser Thr Thr Arg Gly Ala Thr Asn Tyr Thr Ala Tyr Asn Met Asp Ala
        2645   2650   2655

Asn Ser Val Gly Ser Val Gly Ser Asp Gly Arg Thr Asn Val Ala Ala
        2660   2665   2670

Gly Ser Ala Asp Thr Asp Ala Val Asn Val Gly Lys Val Thr Asp Ala
        2675   2680   2685

Val Ser Asn Thr Ser Thr Asn Asn Thr Val Thr Asn Asp Thr Arg Val
        2690   2695   2700

Thr Asn Asn Gly Gly Asp Val Thr Thr Gly Ser Thr Lys Tyr Lys Thr
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Asn Thr Asp Gly Ala Asp Ala Asn Ala Gly Lys Asp Ser Val Ala Gly
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Ser Gly Ser Ala Ala Ala Asp Asn Ser Val Ala Gly Thr Gly Ser Val
            2740   2745   2750

Ala Asp Asn Thr Ser Val Gly Ser Ser Thr Asn Arg Arg Thr Asn Val
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Ala Ala Gly Val Asn Ala Thr Asp Ala Val Asn Val Ser Lys Ser Ser
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Ala Gly Gly Val Arg Tyr Asp Thr Lys Ala Asp Gly Ser Asp Tyr Ser
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Asn Thr Gly Gly Gly Asn Ser Gly Thr Thr Arg Ser Asn Val Ser Ala
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Gly Val Asn Asn Asn Asp Ala Val Asn Tyr Ala Lys Ser Val Thr Lys
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Tyr Thr Asp Arg Met Val Met Asp Asn Lys Ser Lys Thr Ser Lys Ser
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Gly Gly Ala Ser Ala Met Ala Met Thr Gly Ala Tyr Thr Gly Ala Ser
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Met Ala Ser Gly Gly Gly Thr Tyr Asn Gly Ser Ala Val Ala Gly Val
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Ser Met Val Ser Ala Asn Gly Arg Trp Val Tyr Lys Gly Ser Thr Asn
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Ser Gly Tyr Ser Ala Ala Gly Ala Gly Trp Met Asn Lys Ile Phe Lys
        2900   2905   2910

Val Ile Trp Asn Pro Ala Thr Gly Ser Tyr Thr Val Ala Ser Glu Thr
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Ala Lys Ser Arg Gly Lys Lys Ser Gly Arg Ser Lys Leu Leu Ile Ser
        2930   2935   2940

Ala Leu Val Ala Gly Gly Leu Leu Ser Ser Phe Gly Ala Ser Ala Asp
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Asn Tyr Thr Gly Gln Pro Thr Asp Tyr Gly Asp Gly Ser Ala Gly Asp
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Gly Trp Val Ala Ile Gly Lys Gly Ala Lys Ala Asn Thr Phe Met Asn
        2980   2985   2990

Thr Ser Gly Ala Ser Thr Ala Leu Gly Tyr Asp Ala Ile Ala Glu Gly
        2995   3000   3005

Page 28

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Glu Tyr Ser Ser Ala Ile Gly Ser Lys Thr Leu Ala Thr Gly Gly Ala
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Ser Met Ala Phe Gly Val Ser Ala Lys Ala Met Gly Asp Arg Ser Val
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Ala Leu Gly Ala Ser Ser Val Ala Asn Gly Asp Arg Ser Met Ala Phe
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Gly Arg Tyr Ala Lys Thr Asn Gly Phe Thr Ser Leu Ala Ile Gly Asp
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Ser Ser Leu Ala Asp Gly Glu Lys Thr Ile Ala Leu Gly Asn Thr Ala
    3075            3080            3085

Lys Ala Tyr Glu Ile Met Ser Ile Ala Leu Gly Asp Asn Ala Asn Ala
    3090            3095            3100

Ser Lys Glu Tyr Ala Met Ala Leu Gly Ala Ser Ser Lys Ala Gly Gly
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Ala Asp Ser Leu Ala Phe Gly Arg Lys Ser Thr Ala Asn Ser Thr Gly
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Ser Leu Ala Ile Gly Ala Asp Ser Ser Ser Asn Asp Asn Ala Ile
            3140            3145            3150

Ala Ile Gly Asn Lys Thr Gln Ala Leu Gly Val Asn Ser Met Ala Leu
    3155            3160            3165

Gly Asn Ala Ser Gln Ala Ser Gly Glu Ser Ser Ile Ala Leu Gly Asn
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Thr Ser Glu Ala Ser Glu Gln Asn Ala Ile Ala Leu Gly Gln Gly Ser
3185            3190            3195            3200

Ile Ala Ser Lys Val Asn Ser Ile Ala Leu Gly Ser Asn Ser Leu Ser
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Ser Gly Glu Asn Ala Ile Ala Leu Gly Glu Gly Ser Ala Ala Gly Gly
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Ser Asn Ser Leu Ala Phe Gly Ser Gln Ser Arg Ala Asn Gly Asn Asp
    3235            3240            3245

Ser Val Ala Ile Gly Val Gly Ala Ala Ala Ala Thr Asp Asn Ser Val
    3250            3255            3260

Ala Ile Gly Ala Gly Ser Thr Thr Asp Ala Ser Asn Thr Val Ser Val
3265            3270            3275            3280

Gly Asn Ser Ala Thr Lys Arg Lys Ile Val Asn Met Ala Ala Gly Ala
            3285            3290            3295

Ile Ser Asn Thr Ser Thr Asp Ala Ile Asn Gly Ser Gln Leu Tyr Thr
            3300            3305            3310

Ile Ser Asp Ser Val Ala Lys Arg Leu Gly Gly Gly Ala Thr Val Gly
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Ser Asp Gly Thr Val Thr Ala Val Ser Tyr Ala Leu Arg Ser Gly Thr
    3330            3335            3340

Tyr Asn Asn Val Gly Asp Ala Leu Ser Gly Ile Asp Asn Asn Thr Leu
                    Page 29
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Gln Trp Asn Lys Thr Ala Gly Ala Phe Ser Ala Asn His Gly Ala Asn
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Ala Thr Asn Lys Ile Thr Asn Val Ala Lys Gly Thr Val Ser Ala Thr
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Ser Thr Asp Val Val Asn Gly Ser Gln Leu Tyr Asp Leu Gln Gln Asp
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Ala Leu Leu Trp Asn Gly Thr Ala Phe Ser Ala Ala His Gly Thr Glu
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Ala Thr Ser Lys Ile Thr Asn Val Thr Ala Gly Asn Leu Thr Ala Gly
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Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Lys Thr Thr Asn Asp Asn
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Val Thr Thr Asn Thr Thr Asn Ile Ala Thr Asn Thr Thr Asn Ile Thr
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Asn Leu Thr Asp Ala Val Asn Gly Leu Gly Asp Asp Ser Leu Leu Trp
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Thr Asn Thr Thr Asn Ile Ala Thr Asn Thr Thr Asn Ile Thr Asn Leu
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Thr Asp Ala Val Asn Gly Leu Gly Asp Asp Ser Leu Leu Trp Asn Lys
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Thr Ala Gly Ala Phe Ser Ala Ala His Gly Thr Asp Ala Thr Ser Lys
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Thr Thr Asn Ile Ala Thr Asn Thr Thr Asn Ile Thr Asn Leu Thr Asp
         3620   3625   3630

Ala Val Asn Gly Leu Gly Asp Asp Ser Leu Leu Trp Asn Lys Thr Ala
     3635   3640   3645

Gly Ala Phe Ser Ala Ala His Gly Thr Asp Ala Thr Ser Lys Ile Thr
     3650   3655   3660

Asn Val Lys Ala Gly Asp Leu Thr Ala Gly Ser Thr Asp Ala Val Asn
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Gly Ser Gln Leu Lys Thr Thr Asn Asp Asn Val Ser Thr Asn Thr Thr

3685   3690   3695

Asn Ile Thr Asn Leu Thr Asp Ala Val Asn Gly Leu Gly Asp Asp Ser
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Leu Leu Trp Asn Lys Thr Ala Gly Ala Phe Ser Ala Ala His Gly Thr
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Asp Ala Thr Ser Lys Ile Thr Asn Val Lys Ala Gly Asp Leu Thr Ala
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Gly Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Lys Thr Thr Asn Asp
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Asn Val Ser Thr Asn Thr Thr Asn Ile Thr Asn Leu Thr Asp Ser Val
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Gly Asp Leu Lys Asp Asp Ser Leu Leu Trp Asn Lys Ala Ala Gly Ala
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Phe Ser Ala Ala His Gly Thr Glu Ala Thr Ser Lys Ile Thr Asn Leu
          3795   3800   3805

Leu Ala Gly Lys Ile Ser Ser Asn Ser Thr Asp Ala Ile Asn Gly Ser
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Gln Leu Tyr Gly Val Ala Asp Ser Phe Thr Ser Tyr Leu Gly Gly Gly
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Ala Asp Ile Ser Asp Thr Gly Val Leu Ser Gly Pro Thr Tyr Thr Ile
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Gly Gly Thr Asp Tyr Thr Asn Val Gly Asp Ala Leu Ala Ala Ile Asn
          3860   3865   3870

Thr Ser Phe Ser Thr Ser Leu Gly Asp Ala Leu Leu Trp Asp Ala Thr
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Ala Gly Lys Phe Ser Ala Lys His Gly Ile Asn Asn Ala Pro Ser Val
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Ile Thr Asp Val Ala Asn Gly Ala Val Ser Ser Thr Ser Ser Asp Ala
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Ile Asn Gly Ser Gln Leu Tyr Gly Val Ser Asp Tyr Ile Ala Asp Ala
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Leu Gly Gly Asn Ala Val Val Asn Thr Asp Gly Ser Ile Thr Thr Pro
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Thr Tyr Ala Ile Ala Gly Gly Ser Tyr Asn Asn Val Gly Asp Ala Leu
          3955   3960   3965

Glu Ala Ile Asp Thr Thr Leu Asp Asp Ala Leu Leu Trp Asp Thr Thr
          3970   3975   3980

Ala Asn Gly Gly Asn Gly Ala Phe Ser Ala Ala His Gly Lys Asp Lys
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Thr Ala Ser Val Ile Thr Asn Val Ala Asn Gly Ala Val Ser Ala Thr
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Ser Asn Asp Ala Ile Asn Gly Ser Gln Leu Tyr Ser Thr Asn Lys Tyr
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Ile Ala Asp Ala Leu Gly Gly Asp Ala Glu Val Asn Ala Asp Gly Thr
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Ile Thr Ala Pro Thr Tyr Thr Ile Ala Asn Thr Asp Tyr Asn Asn Val
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Gly Glu Ala Leu Asp Ala Leu Asp Asn Asn Ala Leu Leu Trp Asp Glu
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Gln Met Ile Asn Gln Leu Ala Gly Asn Thr Ser Glu Thr Tyr Ile Glu
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Glu Asn Gly Ala Gly Ile Asn Tyr Val Arg Thr Asn Asp Ser Gly Leu
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Ala Phe Asn Asp Ala Ser Ala Ser Gly Ile Gly Ala Thr Ala Val Gly
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Tyr Asn Ala Val Ala Ser His Ala Ser Ser Val Ala Ile Gly Gln Asp
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Ser Ile Ser Glu Val Asp Thr Gly Ile Ala Leu Gly Ser Ser Ser Val
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Ser Ser Arg Val Ile Val Lys Gly Thr Arg Asn Thr Ser Val Ser Glu
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Glu Gly Val Val Ile Gly Tyr Asp Thr Thr Asp Gly Glu Leu Leu Gly
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Asn Ala Ile Gly Ala Val Ala Thr Thr Pro Thr Lys Tyr Tyr His Ala
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Met Gly Ala Lys Thr Ile Val Asn Gly Asn Ala Gly Ile Gly Ile Gly
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Leu Asn Thr Leu Val Leu Ala Asp Ala Ile Asn Gly Ile Ala Ile Gly
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Ser Asn Ala Arg Ala Asn His Ala Asp Ser Ile Ala Met Gly Asn Gly
        4340   4345   4350

Ser Gln Thr Thr Arg Gly Ala Gln Thr Asn Tyr Thr Ala Tyr Asn Met
    4355   4360   4365

Asp Ala Pro Gln Asn Ser Val Gly Glu Phe Ser Val Gly Ser Glu Asp
    4370   4375   4380
Gly Gln Arg Gln Ile Thr Asn Val Ala Ala Gly Ser Ala Asp Thr Asp
4385   4390   4395   4400
Ala Val Asn Val Gly Gln Leu Lys Val Thr Asp Ala Gln Val Ser Gln
        4405   4410   4415
Asn Thr Gln Ser Ile Thr Asn Leu Asn Thr Gln Val Thr Asn Leu Asp
        4420   4425   4430
Thr Arg Val Thr Asn Ile Glu Asn Gly Ile Gly Asp Ile Val Thr Thr
        4435   4440   4445
Gly Ser Thr Lys Tyr Phe Lys Thr Asn Thr Asp Gly Ala Asp Ala Asn
    4450   4455   4460
Ala Gln Gly Lys Asp Ser Val Ala Ile Gly Ser Gly Ser Ile Ala Ala
4465   4470   4475   4480
Ala Asp Asn Ser Val Ala Leu Gly Thr Gly Ser Val Ala Asp Glu Glu
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Asn Thr Ile Ser Val Gly Ser Ser Thr Asn Gln Arg Arg Ile Thr Asn
    4500   4505   4510
Val Ala Ala Gly Val Asn Ala Thr Asp Ala Val Asn Val Ser Gln Leu
    4515   4520   4525
Lys Ser Ser Glu Ala Gly Gly Val Arg Tyr Asp Thr Lys Ala Asp Gly
    4530   4535   4540
Ser Ile Asp Tyr Ser Asn Ile Thr Leu Gly Gly Gly Asn Ser Gly Thr
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Thr Arg Ile Ser Asn Val Ser Ala Gly Val Asn Asn Asn Asp Ala Val
        4565   4570   4575
Asn Tyr Ala Gln Leu Lys Gln Ser Val Gln Glu Thr Lys Gln Tyr Thr
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Asp Gln Arg Met Val Glu Met Asp Asn Lys Leu Ser Lys Thr Glu Ser
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Lys Leu Ser Gly Gly Ile Ala Ser Ala Met Ala Met Thr Gly Leu Pro
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Gln Ala Tyr Thr Pro Gly Ala Ser Met Ala Ser Ile Gly Gly Gly Thr
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Tyr Asn Gly Glu Ser Ala Val Ala Leu Gly Val Ser Met Val Ser Ala
        4645   4650   4655
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Val Lys Asp Gly Asp Leu Thr Thr Gly Ser Thr Asp Ala Val Asn Gly
        35   40   45

Ser Gln Leu Lys Thr Thr Asn Asp Ala Val Ala Thr Asn Thr Thr Asn
    50   55   60

Ile Ala Thr Asn Thr Thr Asn Ile Ser Asn Leu Thr Glu Thr Val Thr
65   70   75   80

Asn Leu Gly Glu Asp Ala Leu Lys Trp Asp Lys Asp Asn Gly Val Phe
            85   90   95

Thr Ala Ala His Gly Asn Asn Thr Ala Ser Lys Ile Thr Asn Ile Leu
            100   105   110

Asp Gly Thr Val Thr Ala Thr Ser Ser Asp Ala Ile Asn Gly Ser Gln
        115   120   125

Leu Tyr Asp Leu Ser Ser Asn Ile Ala Thr Tyr Phe Gly Gly Asn Ala
    130   135   140

Ser Val Asn Thr Asp Gly Val Phe Thr Gly Pro Thr Tyr Lys Ile Gly
145   150   155   160

Glu Thr Asn Tyr Tyr Asn Val Gly Asp Ala Leu Ala Ala Ile Asn Ser
            165   170   175

Ser Phe Ser Thr Ser Leu Gly Asp Ala Leu Leu Trp Asp Ala Thr Ala
        180   185   190

Gly Lys Phe Ser Ala Lys His Gly Thr Asn Gly Asp Ala Ser Val Ile
    195   200   205

Thr Asp Val Ala Asp Gly Glu Ile Ser Asp Ser Ser Ser Asp Ala Val
    210   215   220

Asn Gly Ser Gln Leu His Gly Val Ser Ser Tyr Val Val Asp Ala Leu
225   230   235   240

Gly Gly Gly Ala Glu Val Asn Ala Asp Gly Thr Ile Thr Ala Pro Thr
            245   250   255

Tyr Thr Ile Ala Asn Ala Asp Tyr Asp Asn Val Gly Asp Ala Leu Asn
            260   265   270

Ala Ile Asp Thr Thr Pro Asp Asp Ala Leu Leu Trp Asp Ala Asp Ala
    275   280   285

Gly Glu Asn Gly Ala Phe Ser Ala Ala His Gly Lys Asp Lys Thr Ala
    290   295   300

Ser Val Ile Thr Asn Val Ala Asn Gly Ala Ile Ser Ala Ala Ser Ser
305   310   315   320

Page 34

Asp Ala Ile Asn Gly Ser Gln Leu Tyr Thr Thr Asn Lys Tyr Ile Ala
                  325   330   335

Asp Ala Leu Gly Gly Asp Ala Glu Val Asn Ala Asp Gly Thr Ile Thr
              340   345   350

Ala Pro Thr Tyr Thr Ile Ala Asn Ala Glu Tyr Asn Asn Val Gly Asp
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Ala Leu Asp Ala Leu Asp Asp Asn Ala Leu Leu Trp Asp Lys Thr Ala
      370   375   380

Asn Gly Gly Ala Gly Ala Tyr Asn Ala Ser His Asp Gly Lys Ala Ser
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Ile Ile Thr Asn Val Ala Asn Gly Ser Ile Ser Glu Asp Ser Thr Asp
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Ala Val Asn Gly Ser Gln Leu Asn Ala Thr Asn Met Met Ile Glu Gln
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Asn Thr Gln Ile Ile Asn Gln Leu Ala Gly Asn Thr Asp Ala Thr Tyr
      435   440   445

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    450   455   460

Asp Leu Ala Phe Asn Asp Ala Ser Ala Ser Gly Val Gly Ala Thr Ala
465   470   475   480

Val Gly Tyr Asn Ala Val Ala Ser Gly Ala Ser Ser Val Ala Ile Gly
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Gln Asn Ser Ser Ser Thr Val Asp Thr Gly Ile Ala Leu Gly Ser Ser
          500   505   510

Ser Val Ser Ser Arg Val Ile Ala Lys Gly Ser Arg Asp Thr Ser Val
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Thr Glu Asn Gly Val Val Ile Gly Tyr Asp Thr Thr Asp Gly Glu Leu
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Leu Gly Ala Leu Ser Ile Gly Asp Asp Gly Lys Tyr Arg Gln Ile Ile
545   550   555   560

Asn Val Ala Asp Gly Ser Glu Ala His Asp Ala Val Thr Val Arg Gln
          565   570   575

Leu Gln Asn Ala Ile Gly Ala Val Ala Thr Thr Pro Thr Lys Tyr Phe
          580   585   590

His Ala Asn Ser Thr Ala Glu Asp Ser Leu Ala Val Gly Glu Asp Ser
      595   600   605

Leu Ala Met Gly Ala Lys Thr Val Val Asn Gly Asn Ala Gly Ile Gly
    610   615   620

Ile Gly Leu Asn Thr Leu Val Leu Ala Asp Ala Ile Asn Gly Ile Ala
625   630   635   640

Ile Gly Ser Asn Ala Arg Ala Asn His Ala Asn Ser Ile Ala Met Gly
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Asn Gly Ser Gln Thr Thr Arg Gly Ala Gln Thr Gly Tyr Thr Ala Tyr

660   665   670

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        675   680   685

Glu Asp Gly Gln Arg Gln Ile Thr Asn Val Ala Ala Gly Ser Ala Asp
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Thr Asp Ala Val Asn Val Gly Gln Leu Lys Val Thr Asp Glu Arg Val
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Ala Gln Asn Thr Gln Ser Ile Thr Asn Leu Asn Asn Gln Val Thr Asn
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Leu Asp Thr Arg Val Thr Asn Ile Glu Asn Gly Ile Gly Asp Ile Val
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Thr Thr Gly Ser Thr Lys Tyr Phe Lys Thr Asn Thr Asp Gly Val Asp
        755   760   765

Ala Asn Ala Gln Gly Lys Asp Ser Val Ala Ile Gly Ser Gly Ser Ile
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Glu Glu Asn Thr Ile Ser Val Gly Ser Ser Thr Asn Gln Arg Arg Ile
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Thr Asn Val Ala Ala Ser Val Asn Ala Thr Asp Ala Val Asn Val Ser
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Gln Leu Lys Ser Ser Glu Ala Gly Gly Val Arg Tyr Asp Thr Lys Ala
        835   840   845

Asp Gly Ser Ile Asp Tyr Ser Asn Ile Thr Leu Gly Gly Gly Asn Gly
    850   855   860

Ser Thr Thr Arg Ile Ser Asn Val Ser Ala Gly Val Asn Asn Asn Asp
865   870   875   880

Ala Val Asn Tyr Ala Gln Leu Lys Gln Ser Ala Gln Glu Thr Lys Gln
            885   890   895

Tyr Thr Asp Gln Arg Met Val Glu Met Asp Asn Lys Leu Ser Lys Thr
        900   905   910

Glu Ser Lys Leu Ser Gly Gly Ile Ala Ser Ala Met Ala Met Thr Gly
        915   920   925

Leu Pro Gln Ala Tyr Thr Pro Gly Ala Ser Met Ala Ser Ile Gly Gly
    930   935   940

Gly Thr Tyr Asn Gly Glu Ser Ala Val Ala Leu Gly Val Ser Met Val
945   950   955   960

Ser Ala Asn Gly Arg Trp Val Tyr Lys Leu Gln Gly Ser Thr Asn Ser
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Gln Val Lys Leu Pro Pro Val Phe Val Phe Glu Leu Val Glu Asn Gln
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Gly Leu Ala Asn Ile Ala Leu Ile Arg Pro Arg Val Ile Ala Pro Asp
    50   55   60

Asn Asn Leu Arg Pro Gly Gly Ile Val Ser Gly Ile Ala Gly Leu Leu
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Thr Leu Gly Gln Glu Asn Arg Asn Leu Ile Ser Glu Asn Arg Gln Val
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Gln Ile Asn Ser Ala Arg Lys Glu Ala Arg Ala Gly Ala Ala Asn Ala
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Ala Ala Leu Ser Gly Leu Arg Tyr Asp Asn Arg Pro Gly Lys Val Ser
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Ile Ala Thr Gly Val Gly Gly Phe Lys Gly Ser Thr Ala Leu Ala Ala
            180   185   190

Gly Ile Gly Tyr Thr Ser Lys Asn Glu Asn Ala Arg Tyr Asn Val Ser
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Thr Leu Asn
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Gln Val Lys Leu Pro Pro Val Phe Val Phe Glu Leu Val Glu Asn Gln
            35   40   45

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Gly Leu Ala Asn Ile Ala Leu Ile Arg Pro Arg Val Ile Ala Pro Asp
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Asn Asn Leu Arg Pro Gly Gly Ile Val Ser Gly Ile Ala Gly Leu Leu
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Thr Leu Gly Gln Glu Asn Arg Asn Leu Ile Ser Glu Asn Arg Gln Val
            85              90              95
Ile Asn Asn Asn Thr Thr Ala Ile Gly Gln Asn Ser Asp Arg Ile Asp
            100             105             110
Ala Asn Ala Lys Gly Val Ala Asp Asn Arg Ala Ala Ile Gly Gln Asn
            115             120             125
Ser Gly Arg Ile Asp Ala Asn Ala Lys Gly Val Ala Asp Asn Lys Ala
    130             135             140
Ala Ile Gly Arg Asn Ser Gly Arg Ile Asp Ala Asn Ala Lys Gly Val
145             150             155             160
Ala Asp Asn Lys Thr Ala Ile Gly Arg Asn Ser Gly Arg Ile Asp Thr
            165             170             175
Asn Ala Lys Gly Val Ala Asp Asn Arg Ala Ala Ile Ser Gln Asn Arg
            180             185             190
Gly Arg Ile Asn Ala Asn Ala Ala Gly Val Ala Ser Asn Arg Ala Ala
    195             200             205
Ile Arg Gln Asn Ser Ala Ala Ile Ser Ala Leu Gly Gln Arg Val Asp
    210             215             220
Gly Leu Gln Gly Gln Ile Asn Ser Ala Arg Lys Glu Ala Arg Ala Gly
225             230             235             240
Ala Ala Asn Ala Ala Ala Leu Ser Gly Leu Arg Tyr Asp Asn Arg Pro
            245             250             255
Gly Lys Val Ser Ile Ala Thr Gly Val Gly Gly Phe Lys Gly Ser Thr
            260             265             270
Ala Leu Ala Ala Gly Ile Gly Tyr Thr Ser Lys Asn Glu Asn Ala Arg
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Gln Asn Asp Pro Gly Thr Asn Cys Gly Ser Val Gly Asp Ala Tyr Ala
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Page 38

Trp Ala Arg Gly Asp Gly Tyr Ser Gly Cys Lys Val Gly Tyr Glu Ala
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Ala Lys Asn Leu Ala Lys Gly Thr Ala Phe Gly Asn Ser Leu Gly Gln
    50   55   60

Leu Ser Pro Gly Thr Asn Ile Leu Val Tyr Gly Ser Thr Leu Arg Ala
65   70   75   80

Gly Met Asn Asp Glu Val Thr Pro Leu Asp Ser Met Asn Ile Gly Gly
            85   90   95

His Leu Asp Val Trp Gly Ala Ser Gly Phe His Gly Gly Val Asp Met
            100   105   110

Asn Asn Ser Ala Ile Lys Asn Leu Ala Asp Gly Thr Leu Ser Ala Thr
        115   120   125

Ser Thr Glu Ala Val Thr Gly Arg Gln Leu Asn Ala Thr Asn Thr Asn
    130   135   140

Ile Thr Asn Leu Gln Asn Ser Ile Lys Ser Ile Ser Ser Ser Ala Ser
145   150   155   160

Leu Val Gln Gln Ser Ala Ala Gly Lys Asp Ile Thr Val Ala Lys Asp
            165   170   175

Leu Asp Gly Asp Ala Val Asp Phe Ser Gly Lys Lys Leu Ser Asp Ser
            180   185   190

Thr Thr Phe Ser Arg Lys Leu Thr Gly Val Ala Glu Gly Thr Leu Ser
        195   200   205

Ala Thr Ser Thr Asp Ala Val Ser Gly Lys Gln Leu Tyr Thr Thr Asn
    210   215   220

Gln Asn Leu Ser Thr Thr Asn Gln Asn Leu Ala Asp Thr Asn Lys Ser
225   230   235   240

Leu Ala Glu Thr Asn Lys Asn Val Ser Ala Thr Thr Thr Asn Ile Thr
            245   250   255

Asn Leu Gln Asn Thr Ile Lys Asn Ile Ser Gly Gly Ser Ala Gly Leu
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Val Gln Gln Ser Ala Ala Gly Lys Asp Ile Thr Val Ala Lys Asp Leu
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Asp Gly Glu Ala Val Asp Phe Ser Gly Lys Lys Leu Ser Asp Ser Thr
    290   295   300

Thr Phe Ser Arg Lys Leu Thr Gly Val Ala Glu Gly Thr Leu Ser Ala
305   310   315   320

Thr Ser Thr Asp Ala Val Ser Gly Lys Gln Leu Tyr Thr Thr Asn Gln
            325   330   335

Asn Leu Ala Ser Thr Asn Lys Asp Leu Ala Asn Thr Asn Thr Arg Leu
            340   345   350

Thr Thr Ala Glu Gly Asn Leu Ser Ser Asn Thr Thr Ser Ile Thr Asn
        355   360   365

Page 39

Leu Gln Asn Thr Ile Lys Asn Ile Ser Gly Gly Ser Ala Gly Leu Val
    370   375   380

Gln Gln Ser Ala Ala Gly Lys Asp Ile Thr Val Ala Lys Asp Leu Asp
385   390   395   400

Gly Asp Ala Val Asp Phe Ser Gly Lys Lys Leu Ser Asp Ser Thr Thr
            405   410   415

Phe Ser Arg Lys Leu Thr Gly Val Ala Glu Gly Thr Leu Ser Ala Thr
            420   425   430

Ser Thr Asp Ala Val Ser Gly Arg Gln Leu Tyr Thr Thr Asn Gln Asn
            435   440   445

Leu Ser Thr Thr Asn Gln Asn Leu Ala Asp Thr Asn Lys Ser Leu Ala
    450   455   460

Glu Thr Asn Lys Asn Val Ser Ala Thr Thr Thr Asn Ile Thr Asn Leu
465   470   475   480

Gln Asn Thr Val Asn Asn Ile Ser Ser Gly Ser Ala Gly Leu Val Gln
            485   490   495

Gln Ser Ala Ala Gly Lys Asp Ile Thr Val Ala Lys Asp Leu Asp Gly
            500   505   510

Asp Ala Val Asp Phe Ser Gly Lys Lys Leu Ser Asp Ser Thr Thr Phe
            515   520   525

Ser Arg Lys Leu Thr Gly Val Ala Glu Gly Thr Leu Ser Ala Thr Ser
    530   535   540

Thr Asp Ala Val Ser Gly Lys Gln Leu Tyr Thr Thr Asn Gln Asn Leu
545   550   555   560

Ser Thr Thr Asn Gln Asn Leu Ala Asp Thr Asn Lys Ser Leu Ala Glu
            565   570   575

Thr Asn Lys Asn Val Ser Ala Thr Thr Thr Asn Ile Thr Asn Leu Gln
            580   585   590

Asn Thr Val Asn Asn Ile Ser Ser Gly Ser Ala Gly Leu Val Gln Gln
            595   600   605

Ser Ala Ala Gly Lys Asp Ile Thr Val Ala Lys Asn Leu Asp Gly Asp
    610   615   620

Ala Val Asp Phe Ser Gly Lys Lys Leu Ser Asp Ser Thr Thr Phe Ser
625   630   635   640

Arg Lys Leu Thr Gly Val Ala Glu Gly Thr Leu Ser Ala Thr Ser Thr
            645   650   655

Asp Ala Val Ser Gly Lys Gln Leu Tyr Thr Thr Asn Gln Asn Leu Ala
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Ser Thr Asn Lys Asp Leu Ala Asn Thr Asn Thr Arg Leu Thr Thr Ala
    675   680   685

Glu Gly Asn Leu Ser Ser Asn Thr Thr Ser Ile Thr Asn Leu Gln Asn
    690   695   700

Thr Ile Lys Asn Ile Ser Gly Gly Ser Ala Gly Leu Val Gln Gln Ser

Ala Ala Gly Lys Asp Ile Thr Val Ala Lys Asp Leu Asp Gly Asp Ala
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Val Asp Phe Ser Gly Lys Asn Leu Ser Asp Ser Thr Thr Phe Ser Arg
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            755   760   765

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Asn Asn Val Ser Ala Thr Thr Thr Asn Ile Thr Asn Leu Gln Asn Thr
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Val Asn Asn Ile Ser Ser Gly Ser Ala Gly Leu Val Gln Gln Ser Ala
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Ala Gly Lys Asp Ile Thr Val Ala Lys Asp Leu Asp Gly Asp Ala Val
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    850   855   860

Leu Thr Gly Val Ala Glu Gly Thr Leu Ser Ala Thr Ser Thr Asp Ala
865   870   875   880

Val Ser Gly Lys Gln Leu Tyr Ala Thr Asn Gln Asn Val Ser Lys Leu
            885   890   895

Ser Ala Asn Val Thr Asp Val Ser Asp Ser Val Thr Asn Ile Lys Asn
            900   905   910

Thr Met Asn Thr Ile Val Asn Gly Gly Gly Leu Lys Tyr Phe His Ala
        915   920   925

Asn Ser Thr Leu Asp Asp Ala Gln Ala Met Gly Leu Glu Ser Ile Ala
    930   935   940

Phe Gly Gly Ala Ala Val Ala Ala Gly Met Asn Ser Met Ala Met Gly
945   950   955   960

Gly Asn Ala Arg Ala Val Ala Gly Asn Ala Val Ala Leu Gly Ala Gly
            965   970   975

Ser Val Ala Asp Arg Ala Asn Thr Val Ser Val Gly Ser Ala Gly Lys
            980   985   990

Glu Arg Gln Ile Thr Asn Val Ala Ala Gly Thr Ala Asp Thr Asp Ala
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Val Asn Val Ala Gln Leu Lys Ala Ala Gly Ile Ile Asn Gly Ser Gly
    1010   1015   1020

Arg Thr Asn Ala Thr Val Thr Tyr Gly Thr Asn Ala Asp Gly Ser Ala
1025   1030   1035   1040

Asp Tyr Gly Asn Val Thr Leu Gly Gly Gly Asn Ala Pro Ala Gly Thr

Ala Ile His Asn Val Ala Ala Gly Thr Ala Glu Thr Asp Ala Val Asn
                1060   1065   1070

Val Arg Gln Met Asn Ala Ala Ile Ala Ser Val Gln Lys Val Ser Asn
            1075   1080   1085

Thr Asn Asp Pro Met Phe Ala Ala Asp Gly Asp Arg Ala Val Lys Arg
    1090   1095   1100

Ala Ser Ala Lys Gly Thr His Ala Thr Ala Met Gly Ala Ala Ala Ser
1105   1110   1115   1120

Ala Gly Gly Asp Gln Ser Val Ala Thr Gly His Asn Ala Gln Ser Gly
                1125   1130   1135

Gly Asp Ser Ser Val Ala Met Gly Ala Asn Ala Lys Ala Thr Ala Asn
            1140   1145   1150

His Ala Val Ala Val Gly Ser Gly Ser Val Ala Asn Arg Ala Asn Thr
            1155   1160   1165

Met Ser Val Gly Ser Ala Gly Ser Glu Arg Gln Ile Thr Asn Val Ala
    1170   1175   1180

Ala Gly Val Gln Gly Thr Asp Ala Val Asn Val Ser Gln Leu Ser Gln
1185   1190   1195   1200

Ala Val Tyr Ala Ala Val Gly Asp Leu Pro Ala Gly Thr Thr Ala Arg
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Gln Tyr Thr Asp Glu Gln Ile Gly Met Val Arg Gln Gly Ile Ser Gln
                1220   1225   1230

Val Ala Arg Gly Ala Tyr Ser Gly Ile Ala Ala Ala Thr Ala Leu Thr
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Met Ile Pro Asp Val Asp Gln Gly Lys Ser Ile Ala Ile Gly Ile Gly
    1250   1255   1260

Ser Ala Thr Tyr Lys Gly Tyr Gln Ala Val Ala Leu Gly Ala Ser Ala
1265   1270   1275   1280

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Gln Ser Ala Tyr Ala Ala Asn Val Arg Ala Ile Ala Ile Gly Gly Asp
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Asp Ala Phe Ala Trp Arg Glu Ala Glu Gln Thr Lys Ala Gly Gly Ser
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Gln Ser Ile Ala Met Gly Val Arg Ala Arg Thr Lys Ser Leu Val Val
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Asp Asp Pro Asp Thr Val Ala Asn Glu Ala Asp Pro Gly Gly Ala Ser
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Asp Ala Ile Ala Ile Gly Thr Asp Ala Gln Ala Asn Gly Asp Arg Ser
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Leu Ala Ile Gly Arg Gln Asn Gln Ala Gly Asn Glu Gln Ser Ile Gly
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Ile Gly Ala Gly Asn Thr Ala Thr Gly Lys Leu Ser Ile Gly Ile Gly
    130   135   140

Ser Ser Asn Val Ala Ser Gly Glu Gln Ser Leu Ser Leu Gly Ala Gly
145   150   155   160

Asn Asn Ala Leu Gly Gln Gly Ser Ile Ser Ile Gly Thr Glu Thr Thr
            165   170   175

Ala Gly Gly Leu Arg Ser Ile Ala Phe Gly Val Arg Ala Ser Thr Lys
            180   185   190

Glu Ala Asn Leu Asp Ile Pro Asp Asp Val Ala Ala Ile Asp Ala Ile
            195   200   205

Ala Ile Gly Thr Asn Thr Lys Ala Asn Gly Asp Arg Ser Val Ser Ile
    210   215   220

Gly Thr Gly Ser Gln Ala Ser Ser Gly Ala Val Ser Ile Gly Asp Ala
225   230   235   240

Ala Lys Ala Val Gly Asp Lys Ser Val Ser Ile Gly Thr Glu Ser Trp
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Ala Asp Gly Asp Glu Ser Val Ser Ile Gly Leu Val Asn Asn Ala Gly
            260   265   270

Phe Glu Gly Asn Asp Arg Ile Lys Gly Gly Gln Thr Ser Val Ser Leu
            275   280   285

Gly Ala Phe Asn Gln Ser Pro Gly Ile Glu Ala Ile Ala Ile Gly Ala
    290   295   300

Arg Asn Glu Ala Asn Ala Asp Arg Ser Ile Ala Ile Gly Ser Arg Ala
305   310   315   320

Lys Thr Lys Ala Ala Asp Pro Ala Gln Ala Asp Gly Gly Ala Arg Asp
            325   330   335

Ala Val Ala Ile Gly Thr Asp Ala Leu Ala Asn Asp Asp Arg Ser Ile
            340   345   350

Ser Ile Gly Trp Asn Ser Ser Thr Ser Leu Asn Asp Ser Ile Ser Ile
            355   360   365

Gly Thr Arg Ala Thr Ser Gly Ser Ala Gly Asp Ile Met Ile Gly Thr
    370   375   380

Gly Ser Gly Thr Gly Ser Thr Ser Gly Gln Asn Asn Val Ala Leu Gly
385   390   395   400

Val Ala Ala Ser Gln Lys Val Lys Gly Ser Ser Asn Ile Ala Ile Gly
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Asp Ser Ala Gly Gly Ser Arg Glu Gly Asp Asn Asn Val Ala Ile Gly
            420   425   430

Thr Asn Ala Gly Ile Gln Phe Ser Glu Ser Glu His Glu Thr Ala Val
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Arg Ala Asp Leu Val Val Ser Asp Ala Val Ser Ile Gly Asn Glu Ala
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Leu Ala Ser Ala Asp Glu Ala Ile Ala Ile Gly Thr Gly Ala Val Ala
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Ser Gly Leu Lys Ser Ile Ser Ile Gly Val Gly Asn Thr Val Ser Gly
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Ala Ser Ser Gly Ala Ile Gly Asp Pro Thr Asp Ile Thr Gly Thr Gly
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Ser Tyr Ser Leu Gly Asn Asp Asn Thr Ile Ala Ala Asp Asn Ala Gly
    515   520   525

Thr Phe Gly Asn Asp Asn Thr Leu Ala Asp Ala Ala Asp Gly Ser Arg
    530   535   540

Val Ile Gly Asn Gly Asn Asn Ile Asp Val Ser Asp Ala Phe Val Leu
545   550   555   560

Gly Asn Gly Ala Asp Val Thr Glu Val Gly Gly Val Ala Leu Gly Ser
            565   570   575

Gly Ser Val Ser Asp Thr Gly Ala Asp Val Ala Gly Tyr Val Pro Gly
            580   585   590

Gly Ala Ser Thr Ala Asp Gln Asn Ala Ile Glu Ala Thr Gln Ser Thr
    595   600   605

Arg Gly Ala Val Ala Val Gly Asn Pro Asp Ala Glu Thr Gly Val Tyr
    610   615   620

Arg Gln Ile Thr Gly Val Ala Ala Gly Thr Ala Asp Ser Asp Ala Ala
625   630   635   640

Asn Val Ala Gln Leu Lys Ser Val Glu Thr Ile Ala Lys Thr Gly Trp
            645   650   655

Lys Leu Thr Thr Asp Ser Gly Ser Ile Asp Gly Ile Gly Pro Gly Asp
            660   665   670

Glu Leu Val Leu Lys Gly Gly Asp Gly Asn Ile Val Ile Ser Asn Gln
    675   680   685

Ile Leu Ser Asn Asp Val Ser Ile Asp Leu Ala Asp Glu Ile Glu Val
    690   695   700

Asn Arg Val Thr Ala Arg Asp Pro Asp Thr Gly Ala Ser Thr Val Leu
705   710   715   720

Asp Glu Asn Gly Leu Ser Phe Thr Thr Gln Asp Ala Asn Gly Glu Asp
                725   730   735

Thr Ala Leu Gly Pro Arg Val Thr Ala Ala Gly Ile Gln Ala Ala Gly
                740   745   750

Lys Ile Thr Asn Val Ala Ala Gly Glu Ala Asp Thr Asp Ala Val Asn
                755   760   765

Phe Ser Gln Leu Arg Gln Val Glu Thr Ala Ser Gly Asn Thr Asp Gln
    770   775   780

Arg Ala Val Lys Tyr Asp Trp Thr Asp Ala Asn Thr Asn Gly Val Ile
785   790   795   800

Asp Glu Gly Glu Leu Asn Leu Asp Ser Val Thr Leu Ala Gly Gly Met
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Gly Gly Thr Arg Ile Ser Asn Leu Ala Pro Gly Ala Leu Ser Ala Ala
                820   825   830

Ser Thr Asp Ala Val Asn Gly Ser Gln Leu Phe Gly Leu Arg Ser Arg
                835   840   845

Val Ser Asn Val Ala Val Ala Leu Gly Gly Gly Ala Ala Tyr Asp Pro
    850   855   860

Val Lys Asp Glu Trp Ile Ala Pro Lys Tyr Thr Ile Gly Gly Thr Asp
865   870   875   880

Tyr Ser Asn Val Gly Asp Ala Leu Ala Ala Val Gly Gly Thr Ala Gly
                885   890   895

Ala Gly Trp Ser Leu Ser Ala Gln Gly Ala Asn Ala Ser Asn Val Ala
                900   905   910

Pro Gly Glu Thr Val Asp Leu Arg Ser Gly Asp Gly Asn Ile Val Val
                915   920   925

Ser Lys Ala Glu Thr Gly Asp Thr Val Ser Phe Asp Leu Ala Asp Asp
    930   935   940

Leu Asp Val Ser Glu Ser Ile Thr Val Gly Ala Asp Pro Ala Asp Pro
945   950   955   960

Asn Ala Pro Thr Thr Val Ile Thr Gly Gly Ser Ile Val Ile Gly Ser
                965   970   975

Thr Met Leu Gly Ser Asn Gly Leu Val Ile Thr Gly Gly Pro Ser Val
                980   985   990

Thr Thr Asp Gly Ile Asp Ala Gly Gly Met Lys Val Thr Asn Val Ala
                995   1000   1005

Asn Gly Thr Val Ala Lys Asp Ser Lys Asp Ala Val Asn Gly Gly Gln
    1010   1015   1020

Leu Phe Asp Val Val Ala Asn Ala Thr Ala Asn Gly Val Gly Tyr Asp
1025   1030   1035   1040

Asp Lys Ser Lys Gly Thr Leu Thr Leu Glu Gly Ala Asn Gly Thr Lys
                1045   1050   1055

Page 45

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Ile Thr Asn Val Ala Ala Gly Asp Leu Asn Ala Asn Ser Thr Asp Ala
          1060              1065              1070

Val Asn Gly Ser Gln Leu Tyr Ala Thr Asn Val Lys Val Asp Arg Leu
          1075              1080              1085

Asp Thr Glu Val Lys Glu Ile Asp Ser Arg Val Thr Tyr Ile Glu Ser
     1090              1095              1100

Phe Gln Gly Asp Leu Glu Asn Ala Ala Val Tyr Asp Thr Asp Ala Ala
1105              1110              1115              1120

Gly Lys Arg Leu Asn Thr Leu Thr Leu Glu Gly Gly Asp Pro Asp Lys
               1125              1130              1135

Pro Val Leu Ile Ala Asn Val Ala Lys Gly Val Lys Ala Thr Asp Ala
          1140              1145              1150

Val Asn Val Gly Gln Leu Asp Glu Ser Val Ala Glu Ser Lys Ser Tyr
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Thr Asp Glu Lys Thr Glu Trp Ala Ile Asp Gln Ala Ala Ile Tyr Thr
     1170              1175              1180

Asp Gln Val Ile Glu Thr Lys Val Ser Ala Val Asn Asn Tyr Ala Gln
1185              1190              1195              1200

Gln Arg Phe Ala Gln Leu Ser Gly Glu Ile Gly Gln Val Arg Ser Glu
          1205              1210              1215

Ala Arg Gln Ala Ala Ala Ile Gly Leu Ala Ala Ala Ser Leu Arg Phe
          1220              1225              1230

Asp Asn Glu Pro Gly Lys Leu Ser Val Ala Leu Gly Gly Gly Phe Trp
     1235              1240              1245

Arg Ser Glu Gly Ala Leu Ala Phe Gly Ala Gly Tyr Thr Ser Glu Asp
     1250              1255              1260

Gly Arg Val Arg Ala Asn Leu Thr Gly Ala Ala Ala Gly Gly Asn Val
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Gly Val Gly Ala Gly Leu Ser Ile Thr Leu Asn
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Gly Ser Gly Asn Gly Val Thr Gly Asp Asn Thr Ala Ala Phe Gly Ser
     35              40              45

Ser Ile Gly Ile Ala Gly Gly Asn Asn Ala Ala Val Gly Ser Phe Ser
     50              55              60

Thr Val Thr Gly Ser Asn Ser Ala Ala Val Gly Ser Phe Asn Asn Val
                              Page 46
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Ser Gly Asn Asn Ser Gly Ala Phe Gly Thr Gly Gln Asn Ile Arg Gly
                85   90   95

Asn Gly Thr Phe Ala Ile Gly Asp Pro Asn Ile Val Asn Gly Asn Asn
                100   105   110

Ser Leu Val Phe Gly Asp Asn Asn Thr Val Asn Gly Ser Asn Val Ala
                115   120   125

Gly Arg Gly Asp Asn Ile Gln Leu Val Gly Ser Asn Asn Thr Ile Ala
     130   135   140

Ala Thr Ser Ser Ala Ala Gly Ser Ser Val Phe Gly Ser Gly Asn Thr
145   150   155   160

Val Asn Ala Thr Asn Ala Val Val Met Gly Asn Asn Ser Thr Val Ser
                165   170   175

Gly Ala Ser Ser Val Ala Ile Gly Asn Gly Thr Ala Val Thr Gly Ile
                180   185   190

Asn Ala Ile Ala Met Gly Thr Gly Ala Gly Ala Asn Phe Asp Asn Ser
     195   200   205

Val Ala Ile Gly Ser Gly Ala Thr Thr Thr Arg Ala Asn Gln Val Ala
     210   215   220

Val Gly Thr Ala Ser Ser Thr Tyr Thr Met Ser Gly Ile Thr Ser Ala
225   230   235   240

Ala Ser Lys Ala Ala Gln Ser Gly Pro Thr Gln Leu Val Thr Ser Asp
          245   250   255

Ala Ala Gly Asn Leu Ala Thr Thr Ser Leu Ala Gly Leu Gly Leu Ala
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Ser Ala Gly Asp Ile Asn Gly Ile Asn Ser Gln Leu Ala Ala Leu Asn
          275   280   285

Gly Arg Val Asp Asn Leu Thr Arg Glu Ser Arg Gly Gly Val Ala Leu
     290   295   300

Ala Leu Ala Ala Ser Ser Leu Gln Phe Asp Pro Arg Pro Gly Lys Ile
305   310   315   320

Ser Val Ser Gly Gly Phe Gly Asn Phe Gln Gly Gln Ser Gly Leu Ala
          325   330   335

Val Gly Leu Gly Tyr Ser Tyr Ser Asp Ala Met Arg Phe Asn Ala Ala
          340   345   350

Phe Thr Ala Ala Gln Gln Gly Ala Ile Gly Val Arg Ala Gly Ala Ser
     355   360   365

Trp Thr Leu Asn
     370

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            20   25   30

Lys Thr Ser Ser Thr Lys Ala Val Val Gly Ala Leu Gly Leu Ala Ala
            35   40   45

Gly Leu Tyr Gly Ala Asp Ala Phe Ala Leu Gly Gly Gly Leu Thr Leu
    50   55   60

Cys Pro Thr Thr Glu Gly Ser Ala Gly Tyr Thr Ala Gly Ser Ala Ser
65   70   75   80

Ser Ala Asn Gly Ala Tyr Cys Gly Ser Asp Tyr Gln Trp Gly Leu Phe
                85   90   95

Ser Asn Thr Asn Ala Asp Gly Ser Lys Ser Gly Gln Pro Ile Gly Ala
            100   105   110

Ala Ile Glu Gly Met Asn Asp Gly Ser Leu Leu Leu Tyr Gly Pro Asn
            115   120   125

Asn Ile Val Met Lys Asn Leu Val Ser Met Ser Ser Asn Lys Ile Ile
    130   135   140

Asn Leu Ala Pro Gly Thr Val Ser Ser Thr Ser Ala Asp Ala Val Asn
145   150   155   160

Gly Ser Gln Leu Tyr Ala Thr Asn Gln Asn Val Ser Asn Ile Gly Asn
                165   170   175

Thr Val Asn Asn Ile Thr Thr Gly Ala Gly Ile Met Tyr Phe His Val
            180   185   190

Asn Ser Thr Leu Ala Asp Ser Thr Ala Asn Gly Val Asn Ser Ile Ala
    195   200   205

Ile Gly Gly Ala Thr Arg Thr Asp Ala Asn Asn Ser Ile Ser Ile Gly
    210   215   220

Thr Gly Leu Thr Gln Ala Ser Ser Asn Thr Gly Ala Ile Ala Ile Gly
225   230   235   240

Gln Asn Ala Ser Ile Asn Val Tyr Gly Ala Asn Ser Ile Ala Ile Gly
                245   250   255

Thr Asn Ser Ala Thr Gly Gly Ile Gly Gly Ala Ile Ala Leu Gly Glu
                260   265   270

Asn Ala Phe Ala Thr Gly Gly Lys Met Leu Ala Leu Gly Ser Gly Ala
            275   280   285

Ser Ala Thr Thr Ala Asn Ser Val Ala Leu Gly Ser Gly Ser Thr Thr
    290   295   300

Page 48

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Thr Ala Asn Leu Thr Ala Ala Gly Tyr Asn Pro Gly Ser Gly Thr Leu
305               310             315             320

Ala Gly Thr Ser Gln Ala Thr Asn Gly Glu Val Ser Val Gly Asn Ala
                325             330             335

Gly Ala Glu Arg Arg Ile Thr Asn Val Ala Ala Gly Ser Ala Ala Thr
            340             345             350

Asp Ala Val Asn Val Ser Gln Leu Gln Ser Glu Asp Ala Lys Val Asn
            355             360             365

Thr Ile Asn Asn Asn Val Asn Asn Leu Ser Gly Ser Val Thr Asn Ile
    370             375             380

Ser Ser Thr Val Asn Asn Ile Thr Asn Gly Gly Gly Ile Lys Tyr Phe
385             390             395             400

His Ala Asn Ser Thr Gln Ala Asp Ser Ser Ala Thr Gly Thr Asp Ala
            405             410             415

Val Ala Ile Gly Gly Asn Ala Gln Ala Thr Ala Ala Asn Ser Val Ala
        420             425             430

Leu Gly Leu Asn Ser Thr Ser Lys Gly Thr Asn Ala Ile Ala Leu Gly
    435             440             445

Gly Ala Val Ala Gly Gly Ser Tyr Ala Phe Ala Ala Gly Ser Leu Ala
    450             455             460

Leu Ala Ala Thr Thr Gly Asp Ile Ala Leu Gly Ser Ser Ala Thr Ala
465             470             475             480

Ser Ser Ala Asn Ser Asn Ala Tyr Ala Thr Ala Leu Gly Thr Asn Ala
            485             490             495

Leu Ala Asn Ala Thr Asp Ala Thr Ala Ile Gly Glu Gly Ala Ser Ala
            500             505             510

Thr Ala Ala Ser Ser Val Ala Leu Gly Ala Arg Ser Lys Thr Thr Ala
        515             520             525

Asn Leu Ser Thr Ala Gly Tyr Asn Pro Gly Thr Gly Thr Leu Ser Gly
    530             535             540

Thr Thr Pro Thr Gly Glu Val Ser Val Gly Ser Ala Gly Lys Glu Arg
545             550             555             560

Arg Val Thr Asn Val Ala Ala Gly Ser Ala Ala Thr Asp Ala Val Asn
            565             570             575

Val Ser Gln Leu Met Ser Glu Asp Ala Lys Val Asn Thr Ile Asn Asn
        580             585             590

Asn Val Asn Asn Leu Ser Asn Asn Val Thr Asn Ile Ala Gly Asn Val
        595             600             605

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    610             615             620

Lys Tyr Phe His Val Asn Ser Thr Leu Ala Asp Ser Ser Ala Gly Gly
625             630             635             640
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Page 49

Thr Asn Ser Ile Ala Ile Gly Gly Gly Ala Thr Thr Gly Asn Val Thr
            645   650   655

Ala Gly Thr Ser Asp Asn Ile Ser Ile Gly Thr Asn Ala Thr Thr Asn
            660   665   670

Tyr Gly Lys Asn Ile Ala Ile Gly Gly Asn Ala Gln Ala Leu Gly Gly
            675   680   685

Ala Tyr Asp Gly Gly Tyr Asn Thr Ala Ile Gly Glu Asn Ala Ile Ala
    690   695   700

Lys Gly Asp Gly Ala Gly Gly Phe Gly Gly Gly Gly Trp Gly Gln Thr
705   710   715   720

Thr Ala Ile Gly Gly Gly Ser Gln Ala Leu His Asp Asn Thr Thr Ala
            725   730   735

Val Gly Ser Gly Ala Ile Ala Asn Val Ala Asn Ala Thr Ala Leu Gly
            740   745   750

Met Ser Ala Ser Ala Thr Ala Gly Ser Ala Ile Ala Leu Gly Gln Gly
        755   760   765

Ala Val Ala Ser Ala Ala Asn Ser Val Ala Leu Gly Ser Gly Ser Thr
    770   775   780

Thr Thr Xaa Asn Leu Ser Ala Ala Gly Tyr Asn Pro Gly Thr Gly Thr
785   790   795   800

Leu Ser Gly Ile Ala Ser Val Ala Asn Gly Glu Val Ser Val Gly Ala
            805   810   815

Ala Gly Lys Glu Arg Arg Ile Thr Asn Val Ala Ala Gly Ser Ala Ala
            820   825   830

Thr Asp Ala Val Asn Val Ser Gln Leu Gln Ser Glu Asp Ala Lys Val
        835   840   845

Asn Thr Ile Asn Asn Asn Val Asn Asn Leu Ser Gly Ser Val Thr Asn
    850   855   860

Ile Ser Asn Thr Val Asn Asn Ile Thr Asn Gly Gly Gly Ile Lys Tyr
865   870   875   880

Phe His Thr Lys Ser Thr Leu Ala Asp Ser Ser Ala Thr Gly Thr Asp
            885   890   895

Ala Val Ala Ile Gly Gly Asn Ala Gln Ala Thr Ala Ala Asn Ser Val
            900   905   910

Ala Leu Gly Ser Asn Ser Thr Thr Thr Ala Asn Leu Ser Ala Ala Gly
        915   920   925

Tyr Asn Pro Gly Thr Gly Ala Leu Ser Gly Ile Ala Ser Ala Ala Asn
    930   935   940

Gly Glu Val Ser Val Gly Ala Ala Gly Lys Glu Arg Arg Ile Thr Asn
945   950   955   960

Val Ala Ala Gly Ser Ala Ala Thr Asp Ala Val Asn Val Ser Gln Leu
            965   970   975

Gln Ser Glu Asp Ala Lys Val Asn Thr Ile Ser Asn Asn Val Asn Asn

980   985   990
Leu Ser Gly Ser Val Thr Asn Ile Ser Ser Thr Val Asn Asn Ile Thr
        995   1000   1005

Asn Gly Gly Gly Ile Lys Tyr Phe His Thr Asn Ser Thr Leu Ala Asp
        1010   1015   1020

Ser Thr Ala Asn Gly Val Asn Ser Ile Ala Ile Gly Gly Ala Thr Arg
1025   1030   1035   1040

Thr Asp Ala Asn Asn Ser Ile Ser Ile Gly Thr Gly Leu Thr Gln Ala
            1045   1050   1055

Ser Ser Asn Thr Gly Ala Ile Ala Ile Gly Gln Asn Ala Ser Ile Asn
            1060   1065   1070

Val Tyr Gly Ala Asn Ser Ile Ala Ile Gly Thr Asn Ser Ala Thr Gly
        1075   1080   1085

Gly Ile Gly Gly Ala Ile Ala Leu Gly Glu Asn Ala Phe Ala Thr Gly
    1090   1095   1100

Gly Lys Met Leu Ala Leu Gly Ser Gly Ala Ser Ala Thr Thr Ala Asn
1105   1110   1115   1120

Ser Val Ala Leu Gly Ser Gly Ser Thr Thr Thr Ala Asn Leu Thr Ala
            1125   1130   1135

Ala Gly Tyr Asn Pro Gly Ser Gly Thr Leu Ala Gly Thr Ser Gln Ala
        1140   1145   1150

Thr Asn Gly Glu Val Ser Val Gly Asn Ala Gly Ala Glu Arg Arg Ile
        1155   1160   1165

Thr Asn Val Ala Ala Gly Ser Ala Ala Thr Asp Ala Val Asn Val Ser
    1170   1175   1180

Gln Leu Gln Ser Glu Asp Ala Lys Val Asn Thr Ile Asn Asn Asn Val
1185   1190   1195   1200

Asn Asn Leu Ser Asn Asn Val Thr Asn Ile Ala Gly Asn Val Thr Asn
            1205   1210   1215

Ile Ser Asn Thr Val Asn Asn Ile Thr Asn Gly Gly Gly Ile Lys Tyr
        1220   1225   1230

Phe His Thr Lys Ser Thr Leu Ala Asp Ser Ser Ala Thr Gly Thr Asp
        1235   1240   1245

Ala Val Ala Ile Gly Gly Asn Ala Gln Ala Thr Ala Ala Asn Ser Val
    1250   1255   1260

Ala Leu Gly Ser Asn Ser Thr Thr Thr Ala Asn Leu Ser Ala Ala Gly
1265   1270   1275   1280

Tyr Asn Pro Gly Thr Gly Thr Leu Ser Gly Thr Thr Pro Thr Gly Glu
            1285   1290   1295

Val Ser Val Gly Ser Ala Gly Lys Glu Arg Arg Val Thr Asn Val Ala
        1300   1305   1310

Ala Gly Ser Ala Ala Thr Asp Ala Val Asn Val Ser Gln Leu Gln Ser
    1315   1320   1325
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Ala Ile Ile Gly Ser Thr Ala Asn Ala Val Ala Tyr Asp Asp Gly Thr
    1330                1335                1340

Lys Ala Thr Val Thr Leu Lys Gly Ala Ser Gly Thr Lys Ile Thr Asn
1345                1350                1355                1360

Leu Thr Ala Gly Asn Leu Ser Ala Thr Ser Thr Asp Ala Val Asn Gly
                1365                1370                1375

Ser Gln Leu Tyr Ala Thr Asn Gln Asn Val Ser Asn Ile Gly Asn Thr
            1380                1385                1390

Val Asn Asn Ile Thr Asn Gly Gly Gly Ile Lys Tyr Phe His Ala Asn
        1395                1400                1405

Ser Thr Gln Ala Asp Ser Ser Ala Thr Gly Ser Asn Ser Val Ala Val
    1410                1415                1420

Gly Asp Arg Ala Ser Ser Leu Gly Gly Ser Ser Val Ala Met Gly Asp
1425                1430                1435                1440

Gly Ala Thr Ala Val Gly Ala Ala Ser Ile Ala Ile Gly Asn Asn Ala
                1445                1450                1455

Gln Asn Val Thr Gly Ser Asn Asn Ser Val Ala Ile Gly Gly Asp Ser
        1460                1465                1470

Lys Ala Gly Asp Arg Ser Val Ser Leu Gly Asn Gly Ala Asp Thr Ser
    1475                1480                1485

Leu Ser Ser Trp Gly Val Ala Val Gly Thr Asn Ala Asn Val Ser Ala
    1490                1495                1500

Ala Leu Gly Thr Ala Ile Gly Ala Gly Ala Asn Val Ser Gly Ala Asn
1505                1510                1515                1520

Ser Thr Ala Ile Gly Ala Asn Ala Val Ala Ser Ala Thr Asn Ser Val
            1525                1530                1535

Ala Leu Gly Ser Asn Ser Thr Thr Thr Ala Asn Leu Ser Ala Ala Gly
        1540                1545                1550

Tyr Asn Pro Gly Thr Gly Thr Leu Ser Gly Ile Ala Ser Ala Ala Asn
        1555                1560                1565

Gly Glu Val Ser Val Gly Ala Ala Gly Lys Glu Arg Arg Val Thr Asn
    1570                1575                1580

Val Ala Ala Gly Ser Ala Ala Thr Asp Ala Val Asn Val Ser Gln Leu
1585                1590                1595                1600

Gln Ser Glu Asp Ala Lys Val Asn Thr Ile Asn Asn Asn Val Asn Asn
            1605                1610                1615

Leu Ser Gly Ser Val Thr Asn Ile Ser Ser Thr Val Asn Asn Ile Thr
            1620                1625                1630

Asn Gly Ser Gly Ile Lys Tyr Phe His Thr Asn Ser Thr Leu Ala Asp
        1635                1640                1645

Ser Ser Ala Gly Gly Ala Asn Ser Ile Ala Ile Gly Gly Gly Ala Ala
    1650                1655                1660
                        Page 52
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Thr Ser Ser Ser Ala Gly Leu Ser Asp Asn Met Ala Ile Gly Thr Asn
1665            1670        1675            1680

Ala Thr Ala Ser Tyr Gly Lys Asn Ile Ala Ile Gly Gly Gly Ala Gln
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Ala Thr Gly Gly Thr Tyr Asp Gly Gly Tyr Asn Val Ala Leu Gly Glu
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Asn Ala Asn Ala Thr Ala Gly Thr Asn Ala Trp Gly His Asn Thr Ala
        1715            1720            1725

Ile Gly Ala Asn Thr Val Ile Asn Gly Val Asn Ser Val Ala Leu Gly
        1730            1735            1740

Ile Ser Ala Thr Thr Ser Gly Ser Gly Ser Met Ala Phe Gly Ser Ala
1745            1750            1755            1760

Ala Gln Ala Ser Ala Asp Tyr Ala Ile Ala Ser Gly Ala Gly Ala Asn
        1765            1770            1775

Ala Ser Ala Val Asn Ser Val Ala Leu Gly Ser Asn Ser Thr Thr Thr
        1780            1785            1790

Ala Asn Leu Ser Ala Ala Gly Tyr Asn Pro Gly Thr Gly Thr Leu Ser
        1795            1800            1805

Gly Ile Ala Ser Val Ala Asn Gly Glu Val Ser Val Gly Ser Ala Gly
        1810            1815            1820

Lys Glu Arg Arg Val Thr Asn Val Ala Ala Gly Ser Ala Ala Thr Asp
1825            1830            1835            1840

Ala Val Asn Val Ser Gln Leu Gln Ser Glu Asp Ala Lys Val Asn Thr
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Ile Asn Asn Asn Val Asn Asn Leu Ser Asn Asn Val Ser Asn Ile Ala
        1860            1865            1870

Gly Asn Val Thr Asn Ile Ser Asn Thr Val Asn Asn Ile Thr Asn Gly
        1875            1880            1885

Gly Gly Gly Ile Lys Tyr Phe His Ala Asn Ser Thr Leu Ala Asp Ser
        1890            1895            1900

Ser Ala Thr Gly Thr Asp Ala Val Ala Ile Gly Gly Asn Ala Gln Ala
1905            1910            1915            1920

Thr Ala Ala Asn Ser Val Ala Leu Gly Ser Asn Ser Thr Thr Thr Ala
        1925            1930            1935

Asn Leu Ser Ala Ala Gly Tyr Asn Pro Gly Thr Gly Thr Leu Ser Gly
        1940            1945            1950

Thr Thr Pro Val Gly Glu Val Ser Val Gly Ser Ala Gly Lys Glu Arg
        1955            1960            1965

Arg Val Thr Asn Val Ala Ala Gly Ser Ala Ala Thr Asp Ala Val Asn
        1970            1975            1980

Val Ser Gln Leu Gln Ser Ala Ile Ile Gly Ser Thr Ala Asn Ala Val
1985            1990            1995            2000
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Ala Tyr Asp Asp Gly Thr Lys Ala Thr Val Thr Leu Lys Gly Ala Ser
          2005   2010   2015

Gly Thr Lys Ile Thr Asn Leu Thr Ala Gly Asn Leu Ser Ala Thr Ser
          2020   2025   2030

Thr Asp Ala Val Asn Gly Ser Gln Leu Tyr Ala Thr Asn Gln Asn Val
          2035   2040   2045

Ser Asn Val Gly Asn Thr Val Ser Asn Leu Ser Asn Asn Val Thr Asn
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Ile Ala Gly Asn Val Thr Asn Ile Ser Asn Thr Val Asn Asn Ile Thr
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Asn Gly Gly Gly Ile Lys Tyr Phe His Ala Asn Ser Thr Leu Ala Asp
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Ser Ser Ala Thr Gly Thr Asp Ala Val Ala Ile Gly Gly Asn Ala Gln
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Ala Thr Ala Ala Asn Ser Val Ala Leu Gly Ser Asn Ser Thr Thr Thr
          2115   2120   2125

Ala Asn Leu Ser Ala Ala Gly Tyr Asn Pro Gly Thr Gly Ala Leu Ser
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Ala Thr Thr Pro Val Gly Glu Val Ser Val Gly Ser Ala Gly Lys Glu
2145   2150   2155   2160

Arg Arg Val Thr Asn Val Ala Ala Gly Ser Ala Ala Thr Asp Ala Val
          2165   2170   2175

Asn Val Ser Gln Leu Met Ser Glu Asp Ala Lys Val Asn Thr Ile Asn
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Asn Asn Val Asn Asn Leu Ser Asn Asn Val Ser Asn Ile Ala Gly Asn
          2195   2200   2205

Val Thr Asn Ile Ser Asn Thr Val Asn Asn Ile Thr Asn Gly Gly Ser
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Gly Ile Lys Tyr Phe His Ala Asn Ser Thr Leu Ala Asp Ser Ser Ala
2225   2230   2235   2240

Thr Gly Val Asp Ala Val Ala Ile Gly Gly Asn Ala Gln Ala Thr Ala
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Ala Asn Ser Val Ala Leu Gly Ser Asn Ser Thr Thr Thr Ala Asn Leu
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Ser Ala Ala Gly Tyr Asn Pro Gly Thr Gly Ala Leu Ser Gly Ile Ala
          2275   2280   2285

Ser Ala Ala Asn Gly Glu Val Ser Val Gly Ala Ala Gly Lys Glu Arg
          2290   2295   2300

Arg Ile Thr Asn Val Ala Ala Gly Ser Ala Ala Thr Asp Ala Val Asn
2305   2310   2315   2320

Val Ser Gln Leu Gln Ser Glu Asp Ala Lys Val Asn Thr Ile Asn Asn
          2325   2330   2335

Asn Val Asn Asn Leu Ser Asn Asn Val Ser Asn Ile Ala Gly Asn Val
        2340   2345   2350

Thr Asn Ile Ser Asn Thr Val Asn Asn Ile Thr Asn Gly Gly Ser Gly
        2355   2360   2365

Ile Lys Tyr Phe His Ala Asn Ser Thr Leu Ala Asp Ser Ser Ala Thr
    2370   2375   2380

Gly Thr Asp Ala Val Ala Ile Gly Gly Asn Ala Ser Ala Ser Ala Ala
2385   2390   2395   2400

Asn Ser Val Ala Leu Gly Ser Asn Ser Thr Thr Thr Ala Asn Leu Ser
            2405   2410   2415

Ala Ala Gly Tyr Asn Pro Gly Ser Ala Ala Leu Ser Gly Thr Ala Ser
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Ile Thr Asn Val Ala Ala Gly Ser Ala Ala Thr Asp Ala Val Asn Val
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Ser Gln Leu Gln Ser Glu Asp Ala Lys Val Asn Ala Glu Gly Ala Ala
2465   2470   2475   2480

Thr Ala Ala Ala Leu Gly Gly Gly Ser Thr Tyr Asn Thr Thr Thr Gly
            2485   2490   2495

Ala Ile Thr Ser Pro Thr Tyr Ile Ala Gly Gly Lys Thr Phe Asn Asn
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Val Gly Asp Val Val Thr Asn Ile Asp Gly Arg Val Thr Gln Asn Ser
        2515   2520   2525

Thr Asp Ile Thr Asn Leu Thr Thr Thr Ile Asp Asn Gly Thr Ile Gly
    2530   2535   2540

Leu Val Gln Gln Ala Thr Pro Thr Ser Thr Ile Thr Val Ala Lys Asp
2545   2550   2555   2560

Thr Gly Gly Ala Thr Val Asp Phe Arg Gly Thr Gly Asn Ala Thr Arg
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Thr Leu Thr Gly Ile Thr Ala Gly Glu Leu Ser Ala Thr Ser Thr Asp
            2580   2585   2590

Ala Val Asn Gly Ser Gln Leu Tyr Ala Thr Asn Gln Asn Val Ser Asn
        2595   2600   2605

Ile Asp Asn Thr Val Ser Asn Leu Ser Asn Asn Val Thr Asn Ile Ala
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Gly Asn Val Thr Asn Ile Ser Asn Thr Val Asn Asn Ile Thr Asn Gly
2625   2630   2635   2640

Gly Gly Gly Ile Lys Tyr Phe His Ala Asn Ser Thr Leu Ala Asp Ser
            2645   2650   2655

Ser Ala Thr Gly Val Asp Ala Val Ala Ile Gly Gly Asn Ala Gln Ala
        2660   2665   2670

Thr Ala Ala Asn Ser Val Ala Leu Gly Ser Asn Ser Thr Thr Thr Ala
                            Page 55

Asn Leu Ser Ala Ala Gly Tyr Asn Pro Gly Thr Gly Thr Leu Ser Gly
    2690   2695   2700

Ile Ala Ser Ala Ala Asn Gly Glu Val Ser Val Gly Ala Ala Gly Lys
2705   2710   2715   2720

Glu Arg Arg Val Thr Asn Val Ala Ala Gly Ser Ala Ala Thr Asp Ala
                2725   2730   2735

Val Asn Val Ser Gln Leu Gln Ser Glu Asp Ala Lys Val Asn Thr Ile
                2740   2745   2750

Asn Asn Asn Val Asn Asn Leu Ser Asn Asn Val Ser Asn Ile Ala Gly
            2755   2760   2765

Asn Val Thr Asn Ile Ser Asn Thr Val Asn Asn Ile Thr Asn Gly Gly
        2770   2775   2780

Gly Gly Ile Lys Tyr Phe His Ala Asn Ser Thr Leu Ala Asp Ser Ser
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Ala Thr Gly Thr Asn Ser Leu Ala Ala Gly Pro Ala Ala Val Ala Ser
                2805   2810   2815

Ala Thr Asp Ala Val Ala Leu Gly Asn Gly Ala Lys Ala Thr Asn Ala
            2820   2825   2830

Gly Ala Val Ala Leu Gly Ala Gly Ser Thr Thr Thr Thr Ala Val Ala
        2835   2840   2845

Thr Ser Gly Thr Thr Ile Gly Gly Ile Thr Tyr Thr Phe Ala Gly Val
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Ala Pro Ser Ser Thr Val Ser Val Gly Ala Ala Gly Ser Glu Arg Thr
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Ile Thr Asn Val Ala Ala Gly Arg Leu Ser Ala Thr Ser Thr Asp Ala
                2885   2890   2895

Val Asn Gly Ser Glu Leu Phe Ala Thr Asn Gln Gln Val Thr Arg Asn
            2900   2905   2910

Thr Ala Asp Ile Thr Asn Leu Thr Asn Asn Met Asn Ile Gly Ser Val
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Gly Leu Val Gln Gln Asp Ala Thr Thr Arg Thr Ile Thr Val Ala Lys
    2930   2935   2940

Ala Thr Asp Gly Thr Arg Val Asp Phe Thr Gly Thr Gly Gly Ala Arg
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Gln Leu Thr Gly Val Ala Ala Gly Ala Val Asn Ala Thr Ser Val Asp
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Ala Val Asn Gly Ser Gln Leu Tyr Gly Val Ser Gln Ser Val Ala Asp
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Ala Ile Gly Gly Gly Ser Thr Val Asn Thr Asp Gly Ser Ile Ser Ala
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Pro Thr Tyr Val Val Asp Gly Thr Thr Val His Asn Ala Gly Asp Ala

3010   3015   3020

Ile Ser Asn Leu Asp Asn Arg Val Thr Gln Asn Thr Thr Asp Ile Ser
3025   3030   3035   3040

Thr Ile Asn Asn Thr Leu Asn Ser Ile Thr Thr Gly Ala Gly Val Lys
              3045   3050   3055

Tyr Val His Val Asn Ser Thr Leu Ala Asp Ser Leu Ala Lys Gly Ala
          3060   3065   3070

Glu Ser Val Ala Ile Gly Gly Asn Ala Gln Ser Gln Ala Ala Asn Ser
          3075   3080   3085

Val Ala Leu Gly Ser Asn Ser Val Ala Asp Arg Ala Asn Thr Val Ser
          3090   3095   3100

Val Gly Ala Ala Gly Ala Glu Arg Gln Ile Thr Asn Val Ala Ala Gly
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Thr Ala Asp Thr Asp Ala Val Asn Val Ala Gln Leu Lys Ala Ser Gly
              3125   3130   3135

Val Ile Asn Thr Asp Gly Thr Thr Asn Ala Ala Val Thr Tyr Asp His
          3140   3145   3150

Asn Ala Asp Gly Ser Ala Asn Tyr Asn Ser Val Thr Met Gly Asn Gly
          3155   3160   3165

Val Ala Gly Gly Thr Thr Ile His Asn Val Ala Ala Gly Ser Ala Ala
          3170   3175   3180

Asp Asp Ala Val Asn Val Ser Gln Met Asn Ala Ala Ile Ser Ser Val
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Ser Asn Ile Ile Gly Ser Ala Gly Asn Pro Leu Phe Thr Ala Asp Gly
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Asn Arg Asp Thr Glu Ala Ala Val Ala Ser Gly Thr His Ala Thr Ala
              3220   3225   3230

Met Gly Ala Asn Ala Lys Ala Ser Ala Ala Asn Ser Val Ala Leu Gly
          3235   3240   3245

Ala Asn Ser Val Ala Asp Arg Glu Asn Thr Val Ser Val Gly Ser Ala
          3250   3255   3260

Gly Asn Glu Arg Gln Val Thr Asn Val Ala Ala Gly Thr Ala Thr Thr
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Asp Ala Val Asn Val Gly Gln Leu Asn Gln Ala Ile Gly Ala Ser Ile
              3285   3290   3295

Gly Asn Leu Pro Ala Gly Met Ser Ala Lys Asp Tyr Thr Asp Gln Gln
          3300   3305   3310

Ile Asn Ala Val Gln Asn Gly Val Asn Gln Val Ala Lys Asn Ala Tyr
          3315   3320   3325

Ala Gly Ile Ala Ala Ala Thr Ala Leu Thr Met Ile Pro Asp Val Asp
          3330   3335   3340

Gln Gly Lys Thr Ile Ala Val Gly Val Gly Gly Gly Ser Tyr Lys Gly
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Ser Gln Ala Val Ala Leu Gly Ile Ser Ala Arg Ile Thr Gln Asn Leu
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Lys Met Lys Ala Gly Ala Gly Thr Ser Ser Gln Gly Thr Thr Val Gly
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Leu Gly Ala Ser Tyr Gln Trp
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Arg Thr Asn Asp Thr Gly Leu Thr Phe Thr Asp Ala Ser Ala Ala Gly
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Ile Gly Ser Thr Ala Val Gly Tyr Asn Thr Val Ala Lys Gly Asp Asn
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Ser Val Ala Met Gly Tyr Asn Ser Phe Ala Glu Gly His Ser Ser Val
65   70   75   80

Ala Ile Gly Gln Gly Ser Tyr Ser Gly Val Glu Thr Ser Ile Ala Leu
        85   90   95

Gly Ser Glu Ser Val Ser Ser Arg Val Ile Val Lys Gly Ser Arg Asn
        100   105   110

Thr Ser Val Ser Glu Glu Gly Val Val Ile Gly Tyr Asp Thr Thr Asp
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Gly Glu Leu Leu Gly Ala Leu Ser Ile Gly Asp Asp Gly Lys Tyr Arg
    130   135   140

Gln Ile Ile Asn Val Ala Asp Gly Ser Glu Ala His Asp Ala Val Thr
145   150   155   160

Val Arg Gln Leu Gln Asn Ala Ile Gly Ala Val Ala Thr Thr Pro Thr
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Lys Tyr Tyr His Ala Asn Ser Thr Ala Glu Asp Ser Leu Ala Val Gly
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Glu Asp Ser Leu Ala Met Gly Ala Lys Thr Ile Val Asn Gly Asn Ala
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Gly Ile Gly Ile Gly Leu Asn Thr Leu Val Leu Ala Asp Ala Ile Asn
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Gly Ile Ala Ile Gly Ser Asn Ala Arg Ala Asn His Ala Asp Ser Ile
225   230   235   240

Ala Met Gly Asn Gly Ser Gln Thr Thr Arg Gly Ala Gln Thr Asn Tyr
        245   250   255

Page 58

Thr Ala Tyr Asn Met Asp Ala Pro Gln Asn Ser Val Gly Glu Phe Ser
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Val Gly Ser Glu Asp Gly Gln Arg Gln Ile Thr Asn Val Ala Ala Gly
          275   280   285

Ser Ala Asp Thr Asp Ala Val Asn Val Gly Gln Leu Lys Val Thr Asp
      290   295   300

Ala Gln Val Ser Gln Asn Thr Gln Ser Ile Thr Asn Leu Asn Thr Gln
305   310   315   320

Val Thr Asn Leu Asp Thr Arg Val Thr Asn Ile Glu Asn Gly Ile Gly
              325   330   335

Asp Ile Val Thr Thr Gly Ser Thr Lys Tyr Phe Lys Thr Asn Thr Asp
              340   345   350

Gly Val Asp Ala Asn Ala Gln Gly Lys Asp Ser Val Ala Ile Gly Ser
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Gly Ser Ile Ala Ala Ala Asp Asn Ser Val Ala Leu Gly Thr Gly Ser
      370   375   380

Val Ala Asn Glu Glu Asn Thr Ile Ser Val Gly Ser Ser Thr Asn Gln
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Arg Arg Ile Thr Asn Val Ala Ala Gly Val Asn Ala Thr Asp Ala Val
              405   410   415

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Gly Asn Gly Gly Thr Thr Arg Ile Ser Asn Val Ser Ala Gly Val Asn
      450   455   460

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465   470   475   480

Thr Lys Gln Tyr Thr Asp Gln Arg Met Val Glu Met Asp Asn Lys Leu
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          500   505   510

Met Thr Gly Leu Pro Gln Ala Tyr Thr Pro Gly Ala Ser Met Ala Ser
          515   520   525

Ile Gly Gly Gly Thr Tyr Asn Gly Glu Ser Ala Val Ala Leu Gly Val
      530   535   540

Ser Met Val Ser Ala Asn Gly Arg Trp Val Tyr Lys Leu Gln Gly Ser
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Trp

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Page 60

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<212>   DNA

Page 72

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Page 75

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gtcaacgcca ccaatgccgt ggtgatgggc aacaacagca ccgtctccgg cgcgtcctct    540
gtcgcgatcg gcaatggcac ggccgttacc ggcatcaacg cgatcgcgat gggcaccggc    600
gccggcgcga atttcgacaa ctcggtcgcg atcggcagcg cgcgaccac gacgcgcgcc     660
aaccaggtcg cagtcggcac cgccagcagc acctacacga tgagcggcat cacctcggct    720
gcgagcaagg cggcgcagtc cggaccgacc cagctcgtca catcggacgc ggccggcaat    780
ctggcgacca cctcgctggc tggcctcgga cttgcctccg ccggcgacat caacggaatc    840
aactcccaac tggccgccct caacggccgc gtcgacaacc tgacacggga gtcgcgcggc    900
ggcgtggcgt tggcgctcgc ggcgtccagc ctgcaattcg atcctcgccc cggcaagatc    960
tcggtctccg gcggcttcgg caatttccag ggacaatccg gcctcgcggt cggcctcggc   1020
tattcctatt cggacgccat gcgcttcaac gcggcgttca cggccgcaca gcaaggcgcc   1080
atcggcgtca gggccggcgc gtcgtggacg ctgaactga                          1119
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<210> 37
<211> 364
<212> PRT
<213> Neisseria meningitidis

<400> 37

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1               5                   10                  15

Ala Thr Phe Cys Ser Gly Ala Leu Ala Ala Thr Ser Asp Asp Asp Val
            20                  25                  30

Lys Lys Ala Ala Thr Val Ala Ile Val Ala Ala Tyr Asn Asn Gly Gln
        35                  40                  45

Glu Ile Asn Gly Phe Lys Ala Gly Glu Thr Ile Tyr Asp Ile Gly Glu
    50                  55                  60

Asp Gly Thr Ile Thr Gln Lys Asp Ala Thr Ala Ala Asp Val Glu Ala
65                  70                  75                  80

Asp Asp Phe Lys Gly Leu Gly Leu Lys Lys Val Val Thr Asn Leu Thr
                85                  90                  95

Lys Thr Val Asn Glu Asn Lys Gln Asn Val Asp Ala Lys Val Lys Ala
            100                 105                 110

Ala Glu Ser Glu Ile Glu Lys Leu Thr Thr Lys Leu Ala Asp Thr Asp
            115                 120                 125

Ala Ala Leu Ala Asp Thr Asp Ala Ala Leu Asp Glu Thr Thr Asn Ala
    130                 135                 140

Leu Asn Lys Leu Gly Glu Asn Ile Thr Thr Phe Ala Glu Glu Thr Lys
145                 150                 155                 160

Thr Asn Ile Val Lys Ile Asp Glu Lys Leu Glu Ala Val Ala Asp Thr
                165                 170                 175

Val Asp Lys His Ala Glu Ala Phe Asn Asp Ile Ala Asp Ser Leu Asp
            180                 185                 190

Glu Thr Asn Thr Lys Ala Asp Glu Ala Val Lys Thr Ala Asn Glu Ala
        195                 200                 205

Lys Gln Thr Ala Glu Glu Thr Lys Gln Asn Val Asp Ala Lys Val Lys
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Ala Ala Glu Thr Ala Ala Gly Lys Ala Glu Ala Ala Ala Gly Thr Ala
225   230   235   240

Asn Thr Ala Ala Asp Lys Ala Glu Ala Val Ala Ala Lys Val Thr Asp
                    245   250   255

Ile Lys Ala Asp Ile Ala Thr Asn Lys Ala Asp Ile Ala Lys Asn Ser
                260   265   270

Ala Arg Ile Asp Ser Leu Asp Lys Asn Val Ala Asn Leu Arg Lys Glu
            275   280   285

Thr Arg Gln Gly Leu Ala Glu Gln Ala Ala Leu Ser Gly Leu Phe Gln
        290   295   300

Pro Tyr Asn Val Gly Arg Phe Asn Val Thr Ala Ala Val Gly Gly Tyr
305   310   315   320

Lys Ser Glu Ser Ala Val Ala Ile Gly Thr Gly Phe Arg Phe Thr Glu
                325   330   335

Asn Phe Ala Ala Lys Ala Gly Val Ala Val Gly Thr Ser Ser Gly Ser
                340   345   350

Ser Ala Ala Tyr His Val Gly Val Asn Tyr Glu Trp
        355   360

<210>   38
<211>   455
<212>   PRT
<213>   Yersinia enterocolitica

<400>   38
Met Thr Lys Asp Phe Lys Ile Ser Val Ser Ala Ala Leu Ile Ser Ala
1   5   10   15

Leu Phe Ser Ser Pro Tyr Ala Phe Ala Asp Asp Tyr Asp Gly Ile Pro
            20   25   30

Asn Leu Thr Ala Val Gln Ile Ser Pro Asn Ala Asp Pro Ala Leu Gly
        35   40   45

Leu Glu Tyr Pro Val Arg Pro Pro Val Pro Gly Ala Gly Gly Leu Asn
    50   55   60

Ala Ser Ala Lys Gly Ile His Ser Ile Ala Ile Gly Ala Thr Ala Glu
65   70   75   80

Ala Ala Lys Gly Ala Ala Val Ala Val Gly Ala Gly Ser Ile Ala Thr
                85   90   95

Gly Val Asn Ser Val Ala Ile Gly Pro Leu Ser Lys Ala Leu Gly Asp
                100   105   110

Ser Ala Val Thr Tyr Gly Ala Ala Ser Thr Ala Gln Lys Asp Gly Val
            115   120   125

Ala Ile Gly Ala Arg Ala Ser Thr Ser Asp Thr Gly Val Ala Val Gly
    130   135   140

Phe Asn Ser Lys Ala Asp Ala Lys Asn Ser Val Ala Ile Gly His Ser

Page 77

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        145                  150                  155                  160
Ser His Val Ala Ala Asn His Gly Tyr Ser Ile Ala Ile Gly Asp Arg
                165                  170                  175
Ser Lys Thr Asp Arg Glu Asn Ser Val Ser Ile Gly His Glu Ser Leu
                180                  185                  190
Asn Arg Gln Leu Thr His Leu Ala Ala Gly Thr Lys Asp Thr Asp Ala
            195                  200                  205
Val Asn Val Ala Gln Leu Lys Lys Glu Ile Glu Lys Thr Gln Glu Asn
    210                  215                  220
Thr Asn Lys Arg Ser Ala Glu Leu Leu Ala Asn Ala Asn Ala Tyr Ala
225                  230                  235                  240
Asp Asn Lys Ser Ser Ser Val Leu Gly Ile Ala Asn Asn Tyr Thr Asp
                245                  250                  255
Ser Lys Ser Ala Glu Thr Leu Glu Asn Ala Arg Lys Glu Ala Phe Ala
                260                  265                  270
Gln Ser Lys Asp Val Leu Asn Met Ala Lys Ala His Ser Asn Ser Val
            275                  280                  285
Ala Arg Thr Thr Leu Glu Thr Ala Glu Glu His Ala Asn Ser Val Ala
    290                  295                  300
Arg Thr Thr Leu Glu Thr Ala Glu Glu His Ala Asn Lys Lys Ser Ala
305                  310                  315                  320
Glu Ala Leu Ala Ser Ala Asn Val Tyr Ala Asp Ser Lys Ser Ser His
            325                  330                  335
Thr Leu Lys Thr Ala Asn Ser Tyr Thr Asp Val Thr Val Ser Asn Ser
            340                  345                  350
Thr Lys Lys Ala Ile Arg Glu Ser Asn Gln Tyr Thr Asp His Lys Phe
            355                  360                  365
Arg Gln Leu Asp Asn Arg Leu Asp Lys Leu Asp Thr Arg Val Asp Lys
    370                  375                  380
Gly Leu Ala Ser Ser Ala Ala Leu Asn Ser Leu Phe Gln Pro Tyr Gly
385                  390                  395                  400
Val Gly Lys Val Asn Phe Thr Ala Gly Val Gly Gly Tyr Arg Ser Ser
            405                  410                  415
Gln Ala Leu Ala Ile Gly Ser Gly Tyr Arg Val Asn Glu Asn Val Ala
            420                  425                  430
Leu Lys Ala Gly Val Ala Tyr Ala Gly Ser Ser Asp Val Met Tyr Asn
            435                  440                  445
Ala Ser Phe Asn Ile Glu Trp
    450                  455

<210>    39
<211>    491
<212>    PRT
<213>    Artificial Sequence
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Page 78

<220>
<223>   Consensus of NadA family sequences

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<222>   2, 3, 6, 7, 9, 10, 14, 17, 19, 23, 28, 30, 32, 33, 34, 40, 41, 43, 45, 47,
49, 50, 51, 53-66, 69, 71-75, 78, 84, 90-95, 99, 101-105, 117-119, 123, 126, 127,
129-131, 137, 146, 151-155, 157, 158, 160, 161, 164, 166, 210, 212-214, 216, 218,
222, 223, 231, 233, 236, 237, 239, 240, 243, 244, 246, 247, 249, 250-253, 256-260,
262-264, 266, 267, 271-284, 286, 288, 290, 296, 298, 300, 303, 305, 308-325, 333,
334, 336, 338-340, 342-344, 348, 349, 352, 354, 355, 360, 362, 363, 366-369, 371,
372, 374, 375, 377, 382, 384, 388, 391, 393, 394, 401, 409, 413, 445, 447, 448, 450,
454, 457, 463, 471, 475, 483
<223>   Xaa is any amino acid

<400>   39
Met Xaa Xaa Met Lys Xaa Xaa Lys Xaa Xaa Leu Leu Ala Xaa Ala Ile
1   5   10   15

Xaa Ala Xaa Phe Ser Xaa Gly Ala Leu Ala Ala Xaa Thr Xaa Asp Xaa
        20   25   30

Xaa Xaa Thr Gly Pro Glu Ala Xaa Xaa Val Xaa Ile Xaa Pro Xaa Ala
        35   40   45

Xaa Xaa Xaa Leu Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
    50   55   60

Xaa Xaa Gly Leu Xaa Ala Xaa Ala Xaa Xaa Xaa Xaa Ser Ser Xaa Ala
65   70   75   80

Asp Ala Glu Ala Xaa Val Phe Lys Gly Leu Xaa Xaa Xaa Xaa Xaa Xaa
            85   90   95

Pro Asn Ile Xaa Thr Xaa Xaa Xaa Xaa Xaa Gln Thr Lys Asp Gln Ile
            100   105   110

Ala Met Leu Ile Arg Xaa Xaa Xaa Asn Leu Xaa Glu Asn Lys Xaa Xaa
        115   120   125

Val Xaa Xaa Xaa Val Ala Ala Ile Lys Xaa Ile Pro Lys Asp Leu Ile
    130   135   140

Ala Lys Xaa Ala Asp Val Asp Xaa Xaa Xaa Xaa Xaa Val Xaa Xaa Ala
145   150   155   160

Xaa Xaa Arg Xaa Thr Xaa Ala Xaa Asn Asn Leu Lys Ser Gly His Ser
            165   170   175

Ser His Val Ala Ala Asn His Gly Tyr Ser Ile Ala Ile Gly Asp Arg
            180   185   190

Ser Lys Thr Asp Arg Glu Asn Ser Val Ser Ile Gly His Glu Ser Leu
    195   200   205

Asn Arg Xaa Leu Xaa Xaa Xaa Ala Xaa Lys Xaa Lys Glu Glu Xaa Xaa
    210   215   220

Glu Asn Ile Ala Gln Ile Asp Xaa Asn Xaa Glu Gln Xaa Xaa Glu Xaa
225   230   235   240

Xaa Asp Lys Xaa Xaa Glu Xaa Xaa Asn Xaa Xaa Xaa Xaa Xaa Leu Ala
            245   250   255

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Xaa Xaa Xaa Xaa Xaa Ala Xaa Xaa Xaa Ala Xaa Xaa Val Asn Leu Xaa
            260                 265                 270

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Thr Thr Xaa Asn
            275                 280                 285

Xaa Leu Xaa Gln Lys Ile Ala Glu Xaa Lys Xaa Asn Xaa Asp Ala Xaa
    290                 295                 300

Lys Xaa Lys Ala Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
305             310                 315                 320

Xaa Xaa Xaa Xaa Xaa Xaa Ala Xaa Asn Thr Lys Asp Ile Xaa Xaa Leu
            325                 330                 335

Xaa Thr Xaa Xaa Xaa Asp Xaa Xaa Xaa Asn Ser Ala Xaa Xaa Ala Ala
            340                 345                 350

Xaa Thr Xaa Xaa Ile Ala Thr Glu Xaa Ser Xaa Xaa Phe Glu Xaa Xaa
            355                 360                 365

Xaa Xaa Lys Xaa Xaa Gln Xaa Xaa Gln Xaa Ile Ala Asn Asn Xaa Thr
    370                 375                 380

Xaa Val Ala Ile Xaa Glu Gln Xaa Ile Xaa Xaa Asn Thr Ala Arg Ile
385                 390                 395                 400

Asp Xaa Leu Asp Asn Arg Val Asn Xaa Leu Asp Lys Glu Xaa Lys Ala
            405                 410                 415

Gly Leu Ala Ser Gln Ala Ala Leu Ser Gly Leu Phe Gln Pro Tyr Asn
            420                 425                 430

Val Gly Lys Leu Asn Val Ser Ala Ala Val Gly Gly Tyr Xaa Ser Xaa
            435                 440                 445

Xaa Ala Xaa Ala Ile Gly Xaa Gly Ser Xaa Arg Phe Asn Glu Asn Xaa
    450                 455                 460

Ala Ala Lys Ala Gly Val Ala Xaa Asp Thr Gln Xaa Gly Gly Ser Ser
465                 470                 475                 480

Ala Gly Tyr Xaa Val Gly Val Asn Phe Glu Trp
            485                 490
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<210> 40
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<213> Artificial Sequence

<220>
<223>   forward oligonucleotide primer HOM F

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<210> 41
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<213> reverse oligonucleotide primer HOM R2

<400> 41
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<212>    DNA
<213>    Artificial Sequence

<220>
<223>    reverse oligonucleotide primer HOM R3

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<210>    43
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<212>    DNA
<213>    Artificial Sequence

<220>
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<400>    43
gtgttgatag gtggcactac tg                                           22

<210>    44
<211>    23
<212>    DNA
<213>    Artificial Sequence

<220>
<223>    forward primer for HadA locus

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gcagagaaag caaaaggtga ttc                                          23

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<212>    DNA
<213>    Artificial Sequence

<220>
<223>    forward primer for HadA locus

<400>    45
caaaattctg cagacatcgc aac                                          23

<210>    46
<211>    20
<212>    DNA
<213>    Artificial Sequence

<220>
<223>    forward primer for HadA locus

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caaactgcag ttgctgtagg                                              20

<210>    47
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<212>    DNA
<213>    Artificial Sequence

<220>
<223>    reverse primer for HadA locus
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<400> 47
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<210>   48
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<220>
<223>   reverse primer for HadA locus

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caactccctc ttctaaagct g   21

<210>   49
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<212>   DNA
<213>   Artificial Sequence

<220>
<223>   reverse primer for HadA locus

<400>   49
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<210>   50
<211>   1339
<212>   DNA
<213>   Haemophilus sp

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aattttacat aggaaatttt tctatattgc tttaacgttt ttttatagta gaagtatata   120
ctcagttatg gttatggtta catagtatag ttttactttg ttctagttca ctttaataac   180
cttaaataat tgaggatttc ttatgaaaag aaattatta aaacaatctg taatcgctgt   240
gttgataggt ggcactactg tttctaatta tgctttagca caagcacaag cacaagcaca   300
agtcaaaaaa gatgaactta gtgagttaaa gaaacaagta aaggaaatgg atgctgctat   360
cgatggtatt cttgatgata atattgctta tgaagctgaa gttgatgcaa aacttgatca   420
gcattctgct gctcttggta gacatacaaa tagactcaat aatcttaaaa cgattgcaga   480
gaaagcaaaa ggtgattcaa gtgaagcact tgataaaatt gaagctcttg aagaacaaaa   540
tgatgagttt ttagcggata ttacagcttt agaagaggga gttgatggtt tagatgatga   600
tatcacaggt attcaagata atatttctga tatagaagat gatattaatc aaaattctgc   660
agacattgca actaacacag cggcaatcgc aactcacact caacgtcttg ataatttaga   720
taacagagta aataacctta ataaagatct taaacgtggt cttgctgctc aagctgcatt   780
aaatggttta ttccaaccgt ataacgtagg taaattaaat cttactgctg ctgtaggtgg   840
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ggctaaagca ggtgttgctt tcactcatgg tggcagcgca acttataatg ttggcgtaaa   960
ttttgaatgg taattagata actaattttc cataacagaa aataaatacc tgttttttgag   1020
taatatcaga aacaggtatt ttttatagg cttcgtttcg cacactcgtt actagtgtgg   1080
atatgtgaat aaaatcaata atatttggag tatttcatct attttattaa ttttgttagc   1140
ggataaaata actttctgtg tgttcctcca aattctttaa attcaataaa ccctaatcgt   1200
tcataaaacg agctggcatc atcatttttt gcttcaacga ctaaaattgt agcagctacc   1260
gtagcattct taatcttatg aatggcgtct gcaattagaa acttttccata cccttgcttc   1320
tggaaattcg tatcaatgg   1339

<210>   51
<211>   256
<212>   PRT
<213>   Haemophilus sp

<400>   51
Met Lys Arg Asn Leu Leu Lys Gln Ser Val Ile Ala Val Leu Ile Gly
1   5   10   15

Gly Thr Thr Val Ser Asn Tyr Ala Leu Ala Gln Ala Gln Ala Gln Ala
          20   25   30

Gln Val Lys Lys Asp Glu Leu Ser Glu Leu Lys Lys Gln Val Lys Glu
          35   40   45

Met Asp Ala Ala Ile Asp Gly Ile Leu Asp Asp Asn Ile Ala Tyr Glu
    50   55   60

Ala Glu Val Asp Ala Lys Leu Asp Gln His Ser Ala Ala Leu Gly Arg
65   70   75   80

His Thr Asn Arg Leu Asn Asn Leu Lys Thr Ile Ala Glu Lys Ala Lys
              85   90   95

Gly Asp Ser Ser Glu Ala Leu Asp Lys Ile Glu Ala Leu Glu Glu Gln
          100   105   110

Asn Asp Glu Phe Leu Ala Asp Ile Thr Ala Leu Glu Glu Gly Val Asp
          115   120   125

Gly Leu Asp Asp Asp Ile Thr Gly Ile Gln Asp Asn Ile Ser Asp Ile
    130   135   140

Glu Asp Asp Ile Asn Gln Asn Ser Ala Asp Ile Ala Thr Asn Thr Ala
145   150   155   160

Ala Ile Ala Thr His Thr Gln Arg Leu Asp Asn Leu Asp Asn Arg Val
              165   170   175

Asn Asn Leu Asn Lys Asp Leu Lys Arg Gly Leu Ala Ala Gln Ala Ala
          180   185   190

Leu Asn Gly Leu Phe Gln Pro Tyr Asn Val Gly Lys Leu Asn Leu Thr
          195   200   205

Ala Ala Val Gly Gly Tyr Lys Ser Gln Thr Ala Val Ala Val Gly Thr
    210   215   220

Gly Tyr Arg Tyr Asn Glu Asn Ile Ala Ala Lys Ala Gly Val Ala Phe
225   230   235   240

Thr His Gly Gly Ser Ala Thr Tyr Asn Val Gly Val Asn Phe Glu Trp
              245   250   255

<210>   52
<211>   33
<212>   PRT
<213>   Artificial Sequence

<220>
<223>   HadA C-terminus

<400>   52
Thr Gly Tyr Arg Tyr Asn Glu Asn Ile Ala Ala Lys Ala Gly Val Ala
1   5   10   15

Phe Thr His Gly Gly Ser Ala Thr Tyr Asn Val Gly Val Asn Phe Glu
          20   25   30

Trp

Page 83

<210> 53
<211> 519
<212> DNA
<213> Haemophilus sp

<400> 53
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agaagttcat tttcttgttc agttgaacct ttagaaaact actttcataa gtacgtttct   120
caagatgtaa agaaagggct tgcaaagtgt tttgtgctta taaatgcaca accatctagg   180
attgttggct attacacttt atcggcatta tcaataccaa ttccagatat accccaagaa   240
cgaataagta aaggcgtacc atatcctaat attcctgctg ttttaatagg gcgattagcc   300
attgatacga atttccagaa gcaagggtat ggaaagtttc taattgcaga cgccattcat   360
aagattaaga atgctacggt agctgctaca attttagtcg ttgaagcaaa aaatgatgat   420
gccagctcgt tttatgaacg attagggttt attgaattta agaatttgg aggaacacac   480
agaaagttat tttatccgct aacaaaatta ataaaatag   519

<210> 54
<211> 172
<212> PRT
<213> Haemophilus sp

<400> 54
Met Ile Asn Glu Asn Leu Ala Tyr Leu Ser Val Leu Pro Leu Glu Asp
1   5   10   15

Val Lys Ile Glu Arg Ser Ser Phe Ser Cys Ser Val Glu Pro Leu Glu
            20   25   30

Asn Tyr Phe His Lys Tyr Val Ser Gln Asp Val Lys Lys Gly Leu Ala
            35   40   45

Lys Cys Phe Val Leu Ile Asn Ala Gln Pro Ser Arg Ile Val Gly Tyr
    50   55   60

Tyr Thr Leu Ser Ala Leu Ser Ile Pro Ile Pro Asp Ile Pro Gln Glu
65   70   75   80

Arg Ile Ser Lys Gly Val Pro Tyr Pro Asn Ile Pro Ala Val Leu Ile
                85   90   95

Gly Arg Leu Ala Ile Asp Thr Asn Phe Gln Lys Gln Gly Tyr Gly Lys
            100   105   110

Phe Leu Ile Ala Asp Ala Ile His Lys Ile Lys Asn Ala Thr Val Ala
            115   120   125

Ala Thr Ile Leu Val Val Glu Ala Lys Asn Asp Asp Ala Ser Ser Phe
    130   135   140

Tyr Glu Arg Leu Gly Phe Ile Glu Phe Lys Glu Phe Gly Gly Thr His
145   150   155   160

Arg Lys Leu Phe Tyr Pro Leu Thr Lys Leu Ile Lys
                165   170

<210> 55
<211> 168
<212> PRT
<213> Haemophilus somnus

<400> 55
Met Ile Asn Glu Asn Leu Ala Tyr Leu Ser Val Leu Pro Leu Glu Asp
1   5   10   15

Page 84

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Val Lys Ile Glu Arg Ser Ser Phe Ser Cys Ser Val Glu Pro Leu Glu
              20              25              30
Asn Tyr Phe His Lys Tyr Val Ser Gln Asp Val Lys Lys Gly Leu Ala
              35              40              45
Lys Cys Phe Val Leu Ile Asn Ala Gln Pro Ser Arg Ile Val Gly Tyr
    50              55              60
Tyr Thr Leu Ser Ala Leu Ser Ile Pro Ile Pro Asp Ile Pro Gln Glu
65              70              75              80
Arg Ile Ser Lys Gly Val Pro Tyr Pro Asn Ile Pro Ala Val Leu Ile
              85              90              95
Gly Arg Leu Ala Ile Asp Thr Asn Phe Gln Lys Gln Gly Tyr Gly Lys
              100             105             110
Phe Leu Ile Ala Asp Ala Ile His Lys Ile Lys Asn Ala Thr Val Ala
              115             120             125
Ala Thr Ile Leu Val Val Glu Ala Lys Asn Asp Asp Ala Ser Ser Phe
    130             135             140
Tyr Glu Arg Leu Gly Phe Ile Glu Phe Lys Glu Phe Gly Gly Thr His
145             150             155             160
Arg Lys Leu Phe Tyr Pro Leu Thr
              165

<210>    56
<211>    172
<212>    DNA
<213>    Haemophilus influenzae strain 86028

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tagcaatgtg ggtttcttgt attggtatta actaaattac gcattaataa agcgtaattt   120
aagttaatat cttgtggtac atttaagaat acaaaatgcc catcacctag tg            172

<210>    57
<211>    172
<212>    DNA
<213>    Haemophilus influenzae strain R2846

<400>    57
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tagcaatgtg ggtttcttgt attggtatta actaaattac gcattaataa agcgtaattt   120
aagttaatat cttgtggtac atttaagaat acaaaatgcc catcacctag tg            172

<210>    58
<211>    172
<212>    DNA
<213>    Haemophilus influenzae strain NT36

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tagcaatgtg ggtttcttgt attggtatta actaaattac gcattaataa agcgtaattt   120
aagttaatat cttgtggtac atttaagaat acaaaatgcc catcgcctag tg            172

<210>    59
<211>    172
<212>    DNA
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<213>   Haemophilus influenzae strain EAGAN

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tagcaatgcg ggtttcttgt attggtatta actaaattac gcattaataa agcgtaattt   120
aagttaatat cttgtggtac atttaagaat acaaaatgcc catcgcctag tg   172

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<211>   172
<212>   DNA
<213>   Haemophilus influenzae strain HK707

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tagcaatgcg ggtttcttgt attggtatta actaaattac gcattaataa agcgtaattt   120
aagttaatat cttgtggtac atttaagaat acaaaatgcc catcgcctag tg   172

<210>   61
<211>   172
<212>   DNA
<213>   Haemophilus influenzae strain R2866

<400>   61
gcaagccaag taacagtaat gtttaattag gtatgattta aattctgttt tatatcacac   60
tagaaatgag gatttcttgt attggtatta actaaattac gcattaataa ggcgtaattt   120
aagttaatat cttgtggcac atttaagaat acaaaatgcc catcgcctag tg   172

<210>   62
<211>   21
<212>   DNA
<213>   Haemophilus influenzae

<400>   62
ttaggtatga tttaaattct g   21

<210>   63
<211>   77
<212>   DNA
<213>   Haemophilus influenzae

<400>   63
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tatgaaaaga aatttat   77

<210>   64
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<212>   DNA
<213>   Haemophilus influenzae

<400>   64
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aaattttaca taggaaattt ttctatattg ctttaacgtt tttttatagt agaagtatat   120
actcagttat ggtatggtt acatagtata gttttacttt gttctagttc actttaataa   180
ccttaaataa ttgaggattt cttatgaaaa gaaatttatt aaaacaatct gtaatcgctg   240
tgttgatagg tggcactact gtttctaatt atgctttagc acaagcacaa gcacaagcac   300

<210>   65
<211>   180
<212>   DNA
<213>   Haemophilus influenzae strain Rd and strain F1947

<400>   65
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tagtatagct ttgctttgtt ctagttcaat ttaataatct taaataatta aggatttctt   120

Page 86

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